MAR 11 1924

Technical Paper 354

DEPARTMENT OF THE INTERIOR
HUBERT WORK, SECRETARY
BUREAU OF MINES
H. FOSTER BAIN, DIRECTOR

METAL-MINE ACCIDENTS
IN THE
UNITED STATES

DURING THE CALENDAR YEAR 1922

BY

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WASHINGTON
GOVERNMENT PRINTING OFFICE
1924

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First edition, November, 1923

U.S. Govt.
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3-3-1924

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METAL-MINE ACCIDENTS DURING THE CALENDAR YEAR 1922.

By WILLIAM W. ADAMS.

INTRODUCTION.

The metal-mining industry of the United States in 1922 showed an increase of more than 30 per cent in the volume of work done as compared with 1921, according to reports received from operating companies by the Bureau of Mines of the Department of the Interior.

The operators' reports tabulated by the bureau showed a total of 29,141,293 shifts of work done, an average of 276 workdays for each of the 105,697 men employed at the mines during the year. The average workdays per man during the previous year was 238 and the number of employees was 93,929. Men working underground in 1922 numbered 62,782, and they performed 17,836,061 days of labor, an average of 284 days per man; employees engaged in open-pit mining numbered 13,084 and worked 3,321,871 shifts, an average of 254 days per man; men employed above ground in shops and yards numbered 29,831 and worked 7,983,361 shifts, an average of 268 workdays per man.

Accidents at the mines resulted in the death of 344 men and in the injury of 26,080 others, indicating a fatality rate of 3.54 per thousand full-year workers (300 days) and an injury rate of 268.48, each injury causing disability for at least one day. The injury rate represents a slight and perhaps insignificant increase over 1921, but the fatality rate (3.54) is higher than the 1921 rate (3.09) largely because a disastrous mine fire in California in 1922 caused the loss of 47 lives. Without this disaster, the fatality rate for 1922 would have been 3.06. Men employed underground showed a fatality rate of 5.01 per thousand full-time workers, this rate including deaths in the California mine fire, and an injury rate of 348.71; for open-pit workers the rates were 2.17 and 118.67; for employees in surface shops and yards the fatality rate was 0.83 and the injury rate 151.59.

In copper mining the number of shifts worked by all employees in 1922 indicated a gain of 68 per cent over the year 1921; in iron mining the gain was 29 per cent; in mines producing gold and silver and minor metals, the gain was 10 per cent; in lead-and-zinc mining, 53 per cent; and in mines producing nonmetallic minerals (excluding coal) the gain was 10 per cent.

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For the metal-mining industry as a whole, the operators' reports for 1922 show that 15,369 employees worked 3,435,848 shifts without an accident serious enough to disable the injured man for more than the remainder of the shift The 344 fatalities and 26,080 injuries during the year occurred at mines employing 90,328 men who worked 25,705,444 shifts.

SCOPE OF STATISTICS.

The tables in this paper are based on reports representing 2,599 operators who worked their mines all or part of the year 1922. Data for Alaska were furnished by the Territorial mine inspector and for California by the State industrial commission. The reports for all other States were received directly from the operating companies. Data for Arizona, Idaho, and Utah were received by the bureau in cooperation with the State mine inspector for each of those States. The reports for all States cover prospects as well as producing and nonproducing mines. They are voluntary responses to the bureau's request, as no Federal law requires such reports to be rendered. It is believed that the figures published are reasonably complete for the entire metal-mining industry.

The tables in the following pages are arranged so as to represent five divisions of the mining industry, as follows:

Copper mines.—This group comprises all of the copper mines and prospects reported in operation in the various copper-producing States.

Gold, silver, and miscellaneous metal mines.—This group comprises the gold mines (both lode and placer), silver mines, lead-silver mines, gold-silver mines, the lead and zinc mines other than those in the Mississippi Valley, and the mines working ores of quicksilver, manganese, tungsten, vanadium, chromium, etc. Also pyrite mines are included, as the cinder is used in some metallurgical works for its iron and copper content, and bauxite mines because bauxite is the main source of metallic aluminum.

Iron mines.—All of the important iron mines, representing 110 operators, are included in this group.

Lead and zinc mines (Mississippi Valley).—This group comprises the lead and zinc mines of the Mississippi Valley only.

Nonmetallic mineral mines.—The nonmetallic mineral mines include those producing asbestos, asphaltum, baryte, diamond, emery, feldspar, flint, fluorspar, garnet, graphite, gypsum, kaolin, lithia, magnesite, mica, mineral paint, phosphate rock, quartz, salt, soapstone, sulphur, talc, tripoli, and turquois. Coal mines are not included.

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ACKNOWLEDGMENTS.

The Bureau of Mines thanks the mine operators and State mine officials whose cooperation has made possible an annual statistical study of metal-mine accidents in the United States. Special mention should be made of the assistance rendered by the State mine officials of Alaska, Arizona, California, Idaho, and Utah. The author's acknowledgments are due to Miss Mary Bringhurst for assistance in the preparation of the tables presented herein.

PUBLICATION OF ACCIDENT STATISTICS.

The bureau hopes that the distribution of information on accidents at metal mines will help to establish a uniform basis for recording and reporting mine accidents, the number of men employed, and the number of ~~days or ho~~urs of work performed. When all mine-accident statistics are thus placed on the same basis, the making of comparisons and the drawing of conclusions will be rendered much easier and safety work at mines will be facilitated.

Many States at present have no inspectors for metal mines; the reports issued by the various States lack uniformity, as the fiscal years are not the same and the mines subject to inspection differ; moreover, the States do not agree on what constitutes an injury, and indeed do not all agree in defining the term "fatal accident." Again, compensation laws in most States apply to all mines, but there is lack of uniformity in the classes of accidents reported to the State officials and in the classes of accidents for which compensation is paid.

In addition to the statistical report on accidents at metal mines, the Bureau of Mines issues yearly separate reports covering fatal and nonfatal accidents at mills and smelters, quarries, and coke ovens, and fatal accidents at coal mines.

The bureau will be glad to receive suggestions, from State inspectors and other persons interested in mining, as to the form in which accident statistics can be presented most effectively and their publication made most useful to the mining industry.

CLASSIFICATION OF INJURIES.

The bureau's classification of serious and slight injuries has been on a 14-day (2 weeks) basis since 1915. Prior to that year an injury was not classified as serious unless it resulted in a loss of time of more than 20 days. Details by States and causes for the year 1922 are given in Tables 23 and 24.

The classification and the number of injuries for each group since 1915 are as follows:

Fatal, serious, and slight injuries, 1915 to 1922.

Injury.	1915	1916	1917	1918	1919	1920	1921	1922
1. Fatal	553	697	852	646	468	425	230	344
2. Serious (time lost more than 14 days):								
A. Permanent disability—								
Total[1]	35	44	39	62	7	12	7	9
Partial[2]	574	693	666	640	321	345	173	231
B. Others	7,242	10,099	10,220	9,066	7,848	7,894	4,817	6,510
3. Slight (time lost, 1 to 14 days, inclusive)	27,444	37,401	35,361	33,147	23,330	24,311	13,607	19,330
Total nonfatal injuries	35,295	48,237	46,286	42,915	31,506	32,562	18,604	26,080
Grand total (fatal and nonfatal)	35,848	48,934	47,138	43,561	31,976	32,987	18,834	26,424
Men employed	152,118	204,685	200,579	182,606	145,262	136,583	93,929	105,697

[1] Permanent total disability: Loss of both legs or arms, one leg and one arm, total loss of eyesight, paralysis or other condition permanently incapacitating workman from doing any work of a gainful occupation.

[2] Permanent partial disability: Loss of one foot, leg, hand, eye, one or more fingers, one or more toes, any dislocation where ligaments are severed, or any other injury known in surgery to be permanent partial disability.

ACCIDENT STATISTICS, BY STATES.

A compilation of the accident statistics by causes and States, for all metal mines operated in 1922, is given in Tables 1 to 10, inclusive. Tables 38 to 41, inclusive, give summary data, by States and years, relating to labor, accidents, etc., for the five-year period 1917 to 1921, inclusive, and for 1921 and 1922, separately. The fatalities and injuries in 1922 are classified to show the causes of the accidents in each group of mines, and the percentage of accidents due to any one cause. (Tables 21 and 22.) At the bottom of Table 21 similar percentage figures are given for the 11-year period 1911 to 1921.

TABLE 1.—*ALL MINES: Men employed and days of labor performed, by kinds of mines, during the years ended December 31, 1922 and 1921.*

1922.

Kind of mine.	Active operators.	Men employed.				Days of labor performed.				Average days active.			
		Underground.	Surface.	Open pit.	Total.	Underground.	Surface.	Open pit.	Total.	Underground	Surface.	Open pit.	Total.
Copper	274	17,547	7,073	1,119	25,739	5,246,294	1,951,235	307,454	7,504,983	299	276	275	292
Gold, silver, and miscellaneous metal	1,942	18,362	8,542	710	27,614	5,426,808	2,249,737	166,735	7,843,280	296	263	235	284
Iron	110	17,596	6,715	7,930	32,241	4.566,323	1,728,452	1,991,450	8,286,225	260	257	251	257
Lead and zinc (Mississippi Valley)	74	6.747	2,193	50	8,990	1,878,975	608,566	11,990	2,499,531	278	278	240	278
Nonmetallic mineral	199	2,530	5,308	3,275	11,113	717,661	1,445,371	844,242	3,007,274	284	272	258	271
Total, 1922	**2,599**	**62,782**	**29,831**	**13,084**	**105,697**	**17,836,061**	**7,983,361**	**3,321,871**	**29,141,293**	**284**	**268**	**254**	**276**

1921.

Kind of mine.	Active operators.	Men employed.				Days of labor performed.				Average days active.			
		Underground.	Surface.	Open pit.	Total.	Underground.	Surface.	Open pit.	Total.	Underground	Surface.	Open pit.	Total.
Copper	357	12,865	4,770	665	18,300	3,258.838	1,084,833	117,625	4,461,296	253	227	177	244
Gold, silver, and miscellaneous metal	2,135	17,642	8,197	677	26,516	4,963,389	2,023,301	134,712	7,121,402	281	247	199	269
Iron	122	17,501	7,102	5,956	30,559	3,434,610	1,462.242	1,513,721	6,410,573	196	206	254	210
Lead and zinc (Mississippi Valley)	66	5,302	1,616	30	6,948	1,259.899	364,142	5,150	1,629,191	238	225	172	234
Nonmetallic mineral	216	2,630	4,433	4.543	11,606	642,532	1,133,469	954,239	2,730,240	244	256	210	235
Total, 1921	**2,896**	**55,940**	**26,118**	**11,871**	**93,929**	**13,559,268**	**6,067,987**	**2,725.447**	**22,352,702**	**242**	**232**	**230**	**238**

TABLE 2.—*ALL MINES: Number killed and injured, by kinds of mines, during the years ended December 31, 1922 and 1921.*

1922.

Kind of mine.	Number killed.				Number injured. (Time lost more than 1 day.)				Widows.	Orphans.
	Underground.	Surface.	Open pit.	Total.	Underground.	Surface.	Open pit.	Total.		
Copper	68	2	5	75	6,976	886	163	8,025	19	36
Gold, silver, and miscellaneous metal	131	9	....	140	5,923	794	88	6,805	42	79
Iron	64	4	15	83	3,700	599	602	4,901	57	118
Lead and zinc (Mississippi Valley)	22	....	....	22	3,470	319	79	3,868	15	25
Nonmetallic mineral	13	7	4	24	663	1,436	382	2,481	13	29
Total, 1922	**298**	**22**	**24**	**344**	**20,732**	**4,034**	**1,314**	**26,080**	**146**	**287**

1921.

Kind of mine.	Number killed.				Number injured. (Time lost more than 1 day.)				Widows.	Orphans.
	Underground.	Surface.	Open pit.	Total.	Underground.	Surface.	Open pit.	Total.		
Copper	49	6	....	55	4,073	495	154	4,722	27	39
Gold, silver, and miscellaneous metal	66	12	....	78	4,439	877	36	5,352	25	34
Iron	45	6	14	65	3,126	630	751	4,507	43	108
Lead and zinc (Mississippi Valley)	14	....	....	14	1,875	184	3	2,062	9	32
Nonmetallic mineral	8	4	6	18	627	925	409	1,961	8	19
Total, 1921	**182**	**28**	**20**	**230**	**14,140**	**3,111**	**1,353**	**18,604**	**112**	**232**

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TABLE 3.—*ALL MINES: Fatalities and injuries per 1,000 300-day workers employed during the years ended December 31, 1911 to 1922.*

Kind of mine.	Number of 300-day workers.				Killed per 1,000 300-day workers.				Injured per 1,000 300-day workers.			
	Underground.	Surface.	Open pit.	Total.	Underground.	Surface.	Open pit.	Total.	Underground.	Surface.	Open pit.	Total.
1922.												
Copper	17,488	6,504	1,025	25,017	3.89	0.31	4.88	3.00	398.90	136.22	159.02	320.78
Gold, silver, and miscellaneous metal	18,090	7,498	556	26,144	7.24	1.20	....	5.35	327.42	105.89	158.27	260.29
Iron	15,221	5,762	6,638	27,621	4.20	.69	2.26	3.00	243.09	103.96	90.69	177.44
Lead and zinc (Mississippi Valley)	6,263	2,029	40	8,332	3.51	....	....	2.64	554.05	157.22	....	464.23
Nonmetallic mineral	2,392	4,818	2,814	10,024	5.43	1.45	1.42	2.39	277.17	298.05	135.75	247.51
Total, 1922	**59,454**	**26,611**	**11,073**	**97,138**	**5.01**	**.83**	**2.17**	**3.54**	**348.71**	**151.59**	**118.67**	**268.48**
1921.												
Copper	10,863	3,616	392	14,871	4.51	1.66	....	3.70	374.94	136.89	392.86	317.53
Gold, silver, and miscellaneous metal	16,545	6,744	449	23,738	3.99	1.78	....	3.29	268.30	130.04	80.18	225.46
Iron	11,449	4,874	5,046	21,369	3.93	1.23	2.77	3.04	273.04	129.26	148.83	210.91
Lead and zinc (Mississippi Valley)	4,200	1,214	17	5,431	3.33	....	....	2.58	446.43	151.57	176.47	379.67
Nonmetallic mineral	2,142	3,778	3,181	9,101	3.73	1.06	1.89	1.98	292.72	244.84	128.58	215.47
Total, 1921	**45,199**	**20,226**	**9,085**	**74,510**	**4.03**	**1.38**	**2.20**	**3.09**	**312.84**	**153.81**	**148.93**	**249.69**
Total, 1920	80,215	36,170	18,155	134,540	4.16	1.47	2.09	3.16	310.99	139.45	141.67	242.02
Total, 1919	85,769	36,376	12,726	134,871	4.52	1.15	2.99	3.47	289.16	127.61	162.11	233.60
Total, 1918	113,438	47,726	19,842	181,006	4.52	1.15	3.93	3.57	290.62	140.13	164.30	237.09
Total, 1917	125,990	47,144	18,951	192,085	5.77	1.38	3.17	4.44	291.73	127.38	186.06	240.97
Total, 1916	128,021	50,248	14,186	192,455	4.48	1.51	3.31	3.62	300.33	124.58	248.70	250.64
Total, 1915	91,485	36,895	13,617	141,997	4.93	1.30	3.97	3.89	314.03	104.97	197.77	248.56
Total, 1914	93,618	34,684	14,318	142,620	4.98	1.07	3.91	3.92	256.33	89.84	216.72	211.87
Total, 1913	121,648	61,946	....	183,594	4.50	2.18	....	3.72	209.83	120.20	....	179.59
Total, 1912	105,428	56,235	....	161,663	4.95	2.47	....	4.09	235.80	104.45	....	190.11
Total, 1911	98,976	57,112	....	156,088	5.48	2.68	....	4.45	215.99	90.03	....	170.27

TABLE 4.—*ALL MINES: Number of active operators reporting during the years ended December 31, 1922 and 1921.*

State.	Copper.	Gold, silver, and miscellaneous metal.	Iron.	Lead and zinc (Mississippi Valley).	Non-metallic mineral.	**Total, 1922.**	Total, 1921.
Alabama			13		2	**15**	15
Alaska	12	590			1	**603**	434
Arizona	90	120			1	**211**	280
California	11	201	1		31	**244**	201
Colorado	11	222			11	**244**	344
Florida					13	**13**	18
Georgia		1	1		6	**8**	11
Idaho	28	224			3	**255**	314
Illinois				5		**5**	6
Iowa				1	6	**7**	7
Kansas				14	6	**20**	15
Kentucky				6	3	**9**	9
Michigan	13		27		3	**43**	49
Minnesota		2	36			**38**	41
Missouri			1	9	5	**15**	17
Montana	23	114			2	**139**	189
Nevada	19	181	1		6	**207**	277
New Jersey		1	2			**3**	5
New Mexico	18	35	2		2	**57**	79
New York		1	6		14	**21**	22
North Carolina		2			9	**11**	11
Oklahoma				32	2	**34**	29
Oregon	8	62				**70**	118
Pennsylvania			1		8	**9**	8
South Dakota		19			5	**24**	30
Tennessee	3	1	4	2	9	**19**	16
Texas		4			9	**13**	9
Utah	17	86	3		7	**113**	160
Virginia	1	2	5		6	**14**	15
Washington	18	62	1		3	**84**	99
Wisconsin			4	5	2	**11**	16
Wyoming	2	11	1		2	**16**	19
Other States		1	1		22	**24**	33
Total, 1922	**274**	**1,942**	**110**	**74**	**199**	**2,599**	
Total, 1921	357	2,135	122	66	216		2,896

TABLE 5.—*ALL MINES: Number of employees, and equivalent in 300-day workers, 1922.*

State.	Employees.					Equivalent in 300-day workers.				
	Underground.	Surface.	Open pit.	**Total, 1922.**	Total, 1921.	Underground.	Surface.	Open pit.	**Total, 1922.**	Total, 1921.
Alabama	4,091	1,133	995	**6,219**	4,830	3,512	979	922	**5,413**	2,806
Alaska	1,010	2,290	46	**3,346**	2,736	991	1,562	56	**2,609**	2,064
Arizona	6,569	1,908	371	**8,848**	6,988	6,701	1,855	347	**8,903**	5,585
California	3,180	1,907	137	**5,224**	4,737	3,083	1,877	118	**5,078**	4,499
Colorado	2,410	727	44	**3,181**	3,808	2,237	682	24	**2,943**	3,271
Florida	....	964	795	**1,759**	3,283	....	809	651	**1,460**	2,353
Georgia	13	18	130	**161**	258	12	14	92	**118**	145
Idaho	2,790	1,024	9	**3,823**	3,375	2,418	847	6	**3,271**	2,810
Illinois	306	248	15	**569**	581	264	221	10	**495**	189
Iowa	219	55	....	**274**	295	186	46	....	**232**	208
Kansas	1,068	252	60	**1,380**	868	934	214	58	**1,206**	587
Kentucky	163	204	318	**685**	330	127	171	239	**537**	253
Michigan	11,035	5,852	416	**17,303**	15,951	10,228	5,145	293	**15,666**	11,843
Minnesota	4,099	1,631	6,257	**11,987**	11,414	3,551	1,347	5,337	**10,235**	9,176
Missouri	2,788	1,268	361	**4,417**	4,079	2,815	1,249	358	**4,422**	3,933
Montana	7,754	1,989	8	**9,751**	5,262	7,909	1,956	6	**9,871**	5,137
Nevada	2,065	756	409	**3,230**	3,385	1,957	677	397	**3,031**	3,027
New Jersey	622	123	11	**756**	1,162	534	77	11	**622**	687
New Mexico	750	297	266	**1,313**	2,349	654	221	230	**1,105**	1,192
New York	1,711	820	159	**2,690**	2,521	1,476	717	79	**2,272**	1,874
North Carolina	113	77	162	**352**	323	40	47	152	**239**	184
Oklahoma	2,479	510	15	**3,004**	1,813	2,222	432	11	**2,665**	1,115
Oregon	176	113	8	**297**	487	122	80	2	**204**	207
Pennsylvania	95	137	195	**427**	304	94	136	176	**406**	160
South Dakota	966	703	32	**1,701**	1,648	1,040	774	30	**1,844**	1,850
Tennessee	842	653	569	**2,064**	2,221	733	550	360	**1,643**	1,510
Texas	254	1,262	175	**1,691**	760	288	993	186	**1,467**	688
Utah	3,601	765	365	**4,731**	4,001	4,018	814	324	**5,156**	3,980
Virginia	205	723	263	**1,191**	1,034	166	702	199	**1,067**	874
Washington	234	105	22	**361**	428	150	61	10	**221**	212
Wisconsin	733	294	41	**1,068**	907	565	235	32	**832**	519
Wyoming	123	96	41	**260**	295	112	85	36	**233**	151
Other States	318	927	389	**1,634**	1,496	295	1,056	321	**1,672**	1,420
Total, 1922	**62,782**	**29,831**	**13,084**	**105,697**	....	**59,454**	**26,611**	**11,073**	**97,138**	....
Total, 1921	55,940	26,118	11,871	....	93,929	45,199	20,226	9,085	....	74,509

TABLE 6.—*ALL MINES: Total man-days of labor and average workdays per man, 1922.*

State.	Days of labor performed.					Average days active.				
	Underground.	Surface.	Open pit.	**Total, 1922.**	Total, 1921.	Underground.	Surface.	Open pit.	**Total, 1922.**	Total, 1921.
Alabama	1,053,505	293,611	276,628	**1,623,744**	841,731	258	259	278	**261**	174
Alaska	297,440	468,579	16,698	**782,717**	619,080	294	205	363	**234**	226
Arizona	2,010,455	556,507	104,018	**2,670,980**	1,675,378	306	292	280	**302**	240
California	925,017	562,943	35,450	**1,523,410**	1,349,592	291	295	259	**292**	285
Colorado	671,052	204,536	7,112	**882,700**	981,175	278	281	162	**277**	258
Florida	....	242,702	195,244	**437,946**	706,017	....	252	246	**249**	215
Georgia	3,610	4,186	27,488	**35,284**	43,398	278	233	211	**219**	168
Idaho	725,282	254,188	1,665	**981,135**	842,927	260	248	185	**257**	250
Illinois	79,016	66,350	3,000	**148,366**	56,727	258	268	200	**261**	98
Iowa	55,820	13,861	....	**69,681**	62,288	255	252	....	**254**	211
Kansas	280,371	64,175	17,400	**361,946**	176,982	262	255	290	**262**	204
Kentucky	38,104	51,202	71,848	**161,154**	75,751	234	251	226	**235**	230
Michigan	3,068,437	1,543,443	87,825	**4,699,705**	3,553,013	278	264	211	**272**	223
Minnesota	1,065,333	404,169	1,601,070	**3,070,572**	2,752,669	260	248	256	**256**	241
Missouri	844,468	374,642	107,535	**1,326,645**	1,179,855	303	295	298	**300**	289
Montana	2,372,733	586,824	1,716	**2,961,273**	1,541,120	306	295	215	**304**	293
Nevada	587,009	203,195	119,196	**909,400**	908,170	284	269	291	**282**	268
New Jersey	160,252	23,085	3,388	**186,725**	206,079	258	188	308	**247**	177
New Mexico	196,148	66,240	69,160	**331,548**	357,527	262	223	260	**253**	152
New York	442,743	215,249	23,653	**681,645**	562,345	259	262	149	**253**	223
North Carolina	12,029	14,155	45,675	**71,859**	55,264	106	184	282	**204**	171
Oklahoma	666,679	129,607	3,360	**799,646**	334,477	269	254	224	**266**	184
Oregon	36,499	23,828	720	**61,047**	62,010	207	211	90	**206**	127
Pennsylvania	28,160	40,776	52,945	**121,881**	48,015	296	298	272	**285**	158
South Dakota	311,975	232,320	8,883	**553,178**	555,093	323	330	278	**325**	337
Tennessee	225,757	159,072	108,033	**492,862**	453,089	268	244	190	**239**	204
Texas	86,460	297,895	55,795	**440,150**	206,369	340	236	319	**260**	272
Utah	1,205,380	244,170	97,121	**1,546,671**	1,194,046	335	319	266	**327**	298
Virginia	49,802	210,695	59,745	**320,242**	262,115	243	291	227	**269**	253
Washington	45,014	18,310	2,942	**66,266**	63,553	192	174	134	**184**	118
Wisconsin	169,297	70,579	9,616	**249,492**	155,575	231	240	235	**234**	172
Wyoming	33,683	25,544	10,703	**69,930**	45,465	274	266	261	**269**	154
Other States	88,531	316,723	96,239	**501,493**	415,807	278	342	247	**307**	278
Total, 1922	**17,836,061**	**7,983,361**	**3,321,871**	**29,141,293**	....	**284**	**268**	**254**	**276**	....
Total, 1921	13,559,268	6,067,987	2,725,447	....	22,352,702	242	232	230	....	238

TABLE 7.—***ALL MINES:*** *Deaths and injuries from accidents in 1922, by States.*

State.	Number killed.					Number injured.				
	Underground.	Surface.	Open pit.	**Total, 1922.**	Total, 1921.	Underground.	Surface.	Open pit.	**Total, 1922.**	Total, 1921.
Alabama	15	1	1	**17**	5	894	57	25	**976**	642
Alaska	4	...	...	**4**	13	151	37	4	**192**	218
Arizona	23	...	...	**23**	23	2,920	285	30	**3,235**	1,826
California	60	4	...	**64**	17	1,165	212	20	**1,397**	1,315
Colorado	11	2	...	**13**	15	342	83	2	**427**	733
Florida	...	2	2	**4**	5	...	297	122	**419**	517
Georgia	...	...	...	...	...	...	...	...	...	4
Idaho	9	...	...	**9**	9	852	107	...	**959**	836
Illinois	3	...	...	**3**	1	37	12	...	**49**	16
Iowa	...	...	...	...	1	60	31	...	**91**	51
Kansas	1	...	...	**1**	1	600	41	...	**641**	298
Kentucky	...	...	1	**1**	...	38	6	34	**78**	56
Michigan	33	1	...	**34**	43	3,107	391	38	**3,536**	2,978
Minnesota	16	2	13	**31**	23	711	98	570	**1,379**	1,660
Missouri	11	...	...	**11**	8	865	44	79	**988**	876
Montana	31	1	...	**32**	13	2,361	136	...	**2,497**	864
Nevada	7	3	...	**10**	8	569	101	75	**745**	570
New Jersey	5	...	...	**5**	3	176	18	...	**194**	83
New Mexico	8	...	1	**9**	2	141	76	26	**243**	185
New York	14	2	1	**17**	12	711	266	32	**1,009**	1,067
North Carolina	...	...	...	...	...	5	5	4	**14**	1
Oklahoma	6	...	...	**6**	3	1,794	215	...	**2,009**	699
Oregon	...	...	...	...	2	31	5	...	**36**	26
Pennsylvania	1	...	...	**1**	...	4	5	12	**21**	10
South Dakota	5	...	...	**5**	1	538	64	...	**602**	653
Tennessee	3	...	...	**3**	4	331	37	10	**378**	445
Texas	1	2	...	**3**	...	3	376	20	**399**	273
Utah	22	1	4	**27**	10	2,079	401	84	**2,564**	1,149
Virginia	1	...	...	**1**	2	42	35	19	**96**	114
Washington	3	...	...	**3**	...	13	7	...	**20**	10
Wisconsin	3	...	...	**3**	1	101	22	2	**125**	125
Wyoming	...	...	1	**1**	1	10	8	6	**24**	18
Other States	2	1	...	**3**	4	81	556	100	**737**	286
Total, 1922	**298**	**22**	**24**	**344**	...	**20,732**	**4,034**	**1,314**	**26,080**	...
Total, 1921	182	28	20	...	230	14,140	3,111	1,353	...	18,604

TABLE 8.—*ALL MINES: Fatality rates and injury rates in 1922, by States.*

State.	Killed per 1,000, 300-day workers.					Injured per 1,000, 300-day workers.				
	Underground.	Surface.	Open pit.	**Total, 1922.**	Total, 1921.	Underground.	Surface.	Open pit.	**Total, 1922.**	Total, 1921.
Alabama	4.27	1.02	1.08	**3.14**	1.78	254.56	58.22	27.11	**180.31**	228.80
Alaska	4.04			**1.53**	6.30	152.37	23.69	71.43	**73.59**	105.62
Arizona	3.43			**2.58**	4.12	435.76	153.64	86.46	**363.36**	326.95
California	19.46	2.13		**12.60**	3.78	377.88	112.95	169.49	**275.11**	292.29
Colorado	4.92	2.93		**4.42**	4.59	152.88	121.70	83.33	**145.09**	224.09
Florida		2.47	3.07	**2.74**	2.12		367.12	187.40	**286.99**	219.72
Georgia										27.59
Idaho	3.72			**2.75**	3.20	352.36	126.33		**293.27**	297.51
Illinois	11.36			**6.06**	5.29	140.15	54.30		**98.99**	84.66
Iowa					4.81	322.58	673.91		**392.24**	245.19
Kansas	1.07			**.83**	1.70	642.40	191.59		**531.51**	507.67
Kentucky			4.19	**1.86**		299.21	35.09	142.26	**145.25**	221.34
Michigan	3.23	.19		**2.17**	3.63	303.77	76.00	129.69	**225.71**	251.46
Minnesota	4.51	1.48	2.44	**3.03**	2.51	200.23	72.75	106.80	**134.73**	180.91
Missouri	3.91			**2.49**	2.03	307.28	35.23	220.67	**223.43**	222.73
Montana	3.92	.51		**3.24**	2.53	298.01	69.53		**252.56**	168.19
Nevada	3.58	4.43		**3.30**	2.64	290.75	149.19	188.92	**245.79**	188.31
New Jersey	9.36			**8.04**	4.37	329.59	233.77		**311.90**	120.82
New Mexico	12.23		4.35	**8.14**	1.68	215.60	343.89	113.04	**219.91**	155.20
New York	9.49	2.79	12.66	**7.48**	6.40	481.71	370.99	405.06	**444.10**	569.37
North Carolina						125.00	106.38	26.32	**58.58**	5.43
Oklahoma	2.70			**2.25**	2.69	807.38	497.69		**753.85**	626.91
Oregon					9.66	254.10	63.29		**177.34**	125.60
Pennsylvania	10.64			**2.46**		42.55	36.76	68.18	**51.72**	62.50
South Dakota	4.81			**2.71**	.54	517.31	82.69		**326.46**	352.97
Tennessee	3.98			**1.83**	2.65	439.58	69.81	27.78	**230.07**	294.68
Texas	3.47	2.01		**2.04**		10.42	378.65	107.53	**271.98**	396.80
Utah	5.48	1.23	12.35	**5.24**	2.51	518.42	492.63	259.26	**498.06**	288.69
Virginia	6.02			**.94**	2.29	253.01	49.86	95.48	**89.97**	130.43
Washington	20.00			**13.57**		86.67	114.75		**90.50**	47.17
Wisconsin	5.31			**3.61**	1.93	178.76	93.62	62.50	**150.24**	240.85
Wyoming			27.78	**3.85**	6.62	89.29	83.33	166.67	**92.31**	119.21
Other States	6.78	**.95**		**1.79**	2.82	274.58	526.52	311.53	**440.79**	201.41
Total, 1922	**5.01**	**.83**	**2.17**	**3.54**		**348.71**	**151.59**	**118.67**	**268.48**	
Total, 1921	**4.03**	1.38	2.20		3.09	**312.84**	**153.81**	**148.93**		249.69

TABLE 9.—*ALL MINES: Fatalities, by causes and*

State.	Underground.									
	Fall of rock or ore from roof or wall.	Rock or ore while loading at working face.	Timber or hand tools.	Explosives.	Haulage accidents.	Falling down chute, winze, raise, or stope.	Run of ore from chute or pocket.	Drilling accidents.	Electricity.	Machinery (not including locomotives or drills).
	1	2	3	4	5	6	7	8	9	10
Alabama	9		1	1	4					
Alaska	2	1				1				
Arizona	8			1	4	2	2			
California	4			3		3	1			
Colorado	6			1		3				
Florida										
Georgia										
Idaho	3			2		2				
Illinois	2					1				
Iowa										
Kansas										
Kentucky										
Michigan	12			1	5	4		1	1	
Minnesota	9	1				1	1			1
Missouri	6			2	1					
Montana	15	1		4	3	2				
Nevada	3				2	1				
New Jersey					2	1	2			
New Mexico	3					3			1	
New York	6			3	1			2		1
North Carolina										
Oklahoma	2			1						
Oregon										
Pennsylvania										
South Dakota	1			1			1			
Tennessee	1				1	1				
Texas				1						
Utah	7		1	1	2	6		1		
Virginia				1						
Washington				2		1				
Wisconsin	1			1						
Wyoming										
Other States	1			1						
Total, 1922	**101**	**3**	**2**	**27**	**25**	**32**	**7**	**4**	**2**	**2**
Total, 1921	68	2	1	20	9	13	5		2	

States, during the year ended December 31, 1922.

Underground.						Shaft.						
Mine fires.	Suffocation from natural gases.	Inrush of water.	Stepping on nail.	Other causes.	**Total, underground.**	Falling down shaft.	Objects falling down shafts.	Breaking of cables.	Overwinding.	Skip or cage.	Other causes.	**Total, shaft.**
11	12	13	14	15		16	17	18	19	20	21	
					15							
					4							
					17	2				4		6
47					58	1				1		2
					10		1					1
					7					2		2
					3							
							1					1
					24	3	1	3		2		9
					13	1				1	1	3
					9	1				1		2
				2	27					2	2	4
				1	7							
					5							
					7		1					1
					13		1					1
					3	3						3
				1	1							
					3	1	1					2
					3							
					1							
	1			1	20					1	1	2
					1							
					3							
					2					1		1
					2							
47	1			5	258	12	6	3		15	4	40
	5			11	136	22	7			16	1	46

TABLE 9.—*ALL MINES: Fatalities, by causes and*

State.	Surface.									
	Mine cars, mine locomotives, or aerial trams. 22	Railway cars and locomotives. 23	Run or fall of ore in or from ore bins. 24	Falls of persons. 25	Stepping on nail. 26	Hand tools, axes, bars, etc. 27	Electricity. 28	Machinery. 29	Other causes. 30	Total, surface.
Alabama		1								1
Alaska										
Arizona										
California				1				2	1	4
Colorado							1		1	2
Florida				1			1			2
Georgia										
Idaho										
Illinois										
Iowa										
Kansas										
Kentucky										
Michigan									1	1
Minnesota		1						1		2
Missouri										
Montana				1						1
Nevada	1	1							1	3
New Jersey										
New Mexico										
New York		1					1			2
North Carolina										
Oklahoma										
Oregon										
Pennsylvania										
South Dakota										
Tennessee										
Texas								1	1	2
Utah									1	1
Virginia										
Washington										
Wisconsin										
Wyoming										
Other States									1	1
Total, 1922	1	4		3			3	4	7	22
Total, 1921	6	1		5		1	2	2	11	28

States, during the year ended December 31, 1922—Continued.

Open pit.												
Falls or slides of rock or ore.	Explosives.	Haulage accidents (locomotives, etc.).	Steam shovels.	Falls of persons.	Falls of derricks, booms, etc.	Run or fall of ore in or from ore bins.	Machinery (other than locomotives or steam shovels).	Electricity.	Hand tools.	Other causes.	Total, open pit.	Grand total.
31	32	33	34	35	36	37	38	39	40	41		
										1	1	17
												4
												23
												64
												13
								2			2	4
												9
												3
												1
	1										1	1
												34
4		6	1	1						1	13	31
												11
												32
												10
												5
		1									1	9
										1	1	17
												6
												1
												5
												3
												3
	2									2	4	27
												1
												3
												3
										1	1	1
												3
4	3	7	1	1				2		6	24	344
4	3	5	4		2	1				[illegible]	[illegible]	230

TABLE 10.—*ALL MINES: Injuries, by causes and*

State.	Underground.									
	Fall of rock or ore from roof or wall.	Rock or ore while loading at working face.	Timber or hand tools.	Explosives.	Haulage accidents.	Falling down chute, winze, raise, or stope.	Run of ore from chute or pocket.	Drilling accidents.	Electricity.	Machinery (not including locomotives or drills).
	1	2	3	4	5	6	7	8	9	10
Alabama	91	157	98	15	328	28	2	18	7	8
Alaska	6	39	2	8	28	5	......	10	2	......
Arizona	629	249	299	69	347	58	134	216	11	12
California	274	61	87	12	122	105	31	105	3	7
Colorado	78	17	28	6	43	20	9	28	......	11
Florida	......	......	......	......	......	......	......	......	......	......
Georgia	......	......	......	......	......	......	......	......	......	......
Idaho	167	97	144	4	77	59	2	66	1	9
Illinois	5	7	2	......	9	1	......	8	......	......
Iowa	3	34	2	1	5	......	......	3	......	1
Kansas	68	106	18	1	55	7	......	69	......	14
Kentucky	16	2	2	2	6	......	......	......	......	1
Michigan	670	427	372	17	419	101	91	190	18	35
Minnesota	163	31	163	8	68	29	5	7	3	10
Missouri	131	239	14	7	258	18	......	65	6	6
Montana	597	303	392	22	384	107	19	77	1	5
Nevada	144	62	73	15	74	25	6	57	2	15
New Jersey	16	46	26	3	15	16	3	18	2	2
New Mexico	36	38	4	1	16	6	2	20	......	1
New York	62	212	44	14	81	15	2	109	14	25
North Carolina	3	......	1	......	......	......	......	......	......	......
Oklahoma	376	474	33	10	102	23	10	181	16	35
Oregon	2	5	5	......	1	1	......	4	......	3
Pennsylvania	......	......	1	1	......	......	......	......	......	......
South Dakota	26	173	8	5	46	5	9	51	......	2
Tennessee	40	133	22	6	54	2	2	12	2	14
Texas	......	......	......	......	......	1	......	......	......	......
Utah	1,131	15	246	66	19	10	12	174	41	14
Virginia	5	14	......	2	9	......	......	......	4	3
Washington	1	......	1	......	2	......	1	1	......	1
Wisconsin	18	15	12	1	15	5	1	10	......	2
Wyoming	......	3	5	......	......	......	2	......	......	......
Other States	6	17	1	31	6	1	......	5	1	3
Total, 1922	**4,764**	**2,976**	**2,105**	**327**	**2,589**	**648**	**343**	**1,504**	**134**	**239**
Total, 1921	2,717	2,303	1,487	232	1,849	501	217	1,155	57	197

States, during the year ended December 31, 1922.

Underground.						Shaft.						
Mine fires.	Suffocation from natural gases.	Inrush of water.	Stepping on nail.	Other causes.	**Total, underground.**	Falling down shafts.	Objects falling down shafts.	Breaking of cables.	Overwinding.	Skip or cage.	Other causes.	**Total, shaft.**
11	12	13	14	15		16	17	18	19	20	21	
......	......	......	8	132	**892**	1	......	......	......	......	1	**2**
......	......	......	......	46	**146**	......	......	......	......	4	1	**5**
1	4	......	77	727	**2,833**	10	16	......	......	6	55	**87**
1	4	......	63	236	**1,111**	6	8	1	......	25	14	**54**
......	1	......	23	70	**334**	......	4	......	......	3	1	**8**
......	......	......	......	......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	......	......	......	......	......	......
......	1	......	45	153	**825**	1	9	1	......	2	14	**27**
......	......	......	......	4	**36**	......	1	......	......	......	......	**1**
......	......	......	1	9	**59**	......	......	......	......	......	1	**1**
......	1	......	13	189	**541**	......	6	......	......	5	48	**59**
......	......	......	1	5	**35**	......	2	......	......	1	......	**3**
......	4	......	68	541	**2,953**	8	48	1	......	41	56	**154**
......	1	......	29	164	**681**	3	7	1	......	4	15	**30**
......	2	......	9	103	**858**	2	......	......	......	......	5	**7**
2	1	......	61	322	**2,293**	5	16	......	......	27	20	**68**
......	1	......	16	67	**557**	3	2	......	......	3	4	**12**
......	......	......	1	19	**167**	1	1	......	......	2	5	**9**
......	......	......	4	8	**136**	1	2	......	......	2	......	**5**
......	2	......	11	108	**699**	2	3	......	......	3	4	**12**
......	......	......	......	1	**5**	......	......	......	......	......	......	......
......	......	......	25	357	**1,642**	6	49	......	1	35	61	**152**
......	......	......	1	7	**29**	......	......	......	......	1	1	**2**
......	......	......	1	1	**4**	......	......	......	......	......	......	......
......	......	......	......	201	**526**	1	2	......	1	......	8	**12**
......	......	......	7	31	**325**	......	3	......	......	1	2	**6**
......	1	......	......	......	**2**	1	......	......	......	......	......	**1**
......	......	......	109	160	**1,997**	2	21	......	......	36	23	**82**
......	......	......	......	5	**42**	......	......	......	......	......	......	......
2	......	......	......	3	**12**	......	1	......	......	......	......	**1**
......	......	......	1	11	**91**	......	3	......	......	2	5	**10**
......	......	......	......	......	**10**	......	......	......	......	......	......	......
......	......	......	1	8	**80**	......	......	......	......	1	......	**1**
6	**23**	......	**575**	**3,688**	**19,921**	**53**	**204**	**4**	**2**	**204**	**344**	811
......	32	......	343	2,610	**13,700**	52	114	......	1	140	133	440

TABLE 10.—*ALL MINES: Injuries, by causes and States,*

State.	Surface.									
	Mine cars, mine locomotives, or aerial trams.	Railway cars and locomotives.	Run or fall of ore in or from ore bins.	Falls of persons.	Stepping on nail.	Hand tools, axes, bars, etc.	Electricity.	Machinery.	Other causes	Total, surface.
	22	23	24	25	26	27	28	29	30	
Alabama	14	5	3	2	3	5	......	5	20	57
Alaska	9	......	......	5	......	2	......	3	18	37
Arizona	15	11	1	36	8	17	4	26	167	285
California	5	1	......	44	1	22	4	45	90	212
Colorado	5	2	3	15	5	14	1	20	18	83
Florida	2	37	......	21	19	56	8	56	98	297
Idaho	9	2	......	21	10	12	2	10	41	107
Illinois	......	......	2	......	......	3	......	2	5	12
Iowa	......	1	......	2	2	......	1	1	24	31
Kansas	......	......	......	3	3	11	......	6	18	41
Kentucky	......	2	......	......	1	......	......	3	......	6
Michigan	11	10	10	67	15	50	3	34	191	391
Minnesota	4	3	1	16	4	20	4	4	42	98
Missouri	2	1	......	1	2	5	......	4	29	44
Montana	10	2	4	9	7	40	1	5	58	136
Nevada	6	......	1	6	4	17	3	9	55	101
New Jersey	......	1	......	2	......	2	......	......	13	18
New Mexico	6	5	1	4	1	6	1	14	38	76
New York	4	5	10	18	19	50	8	44	108	266
North Carolina	2	......	......	2	......	......	......	......	1	5
Oklahoma	16	7	27	7	18	20	......	16	104	215
Oregon	1	......	1	......	......	1	......	1	1	5
Pennsylvania	......	......	......	1	......	......	......	......	4	5
South Dakota	......	1	......	4	......	4	......	4	51	64
Tennessee	4	4	......	4	......	4	......	1	20	37
Texas	7	1	1	42	28	39	......	25	233	376
Utah	23	72	9	69	40	68	17	23	80	401
Virginia	2	1	1	6	2	7	......	7	9	35
Washington	......	......	......	3	1	2	......	......	1	7
Wisconsin	5	2	......	3	2	......	......	1	9	22
Wyoming	......	......	......	......	......	2	......	1	5	8
Other States	3	1	......	46	65	36	......	8	397	556
Total, 1922	**165**	**177**	**75**	**459**	**260**	**515**	**57**	**378**	**1,948**	**4,034**
Total, 1921	106	83	36	334	253	466	43	301	1,489	3,111

during the year ended December 31, 1922—Continued.

Open pit.												
Falls or slides of rock or ore.	**Explosives.**	**Haulage accidents (locomotives, etc.).**	**Steam shovels.**	**Falls of persons.**	**Falls of derricks, booms, etc.**	**Run or fall of ore in or from ore bins.**	**Machinery (other than locomotives or steam shovels).**	**Electricity.**	**Hand tools.**	**Other causes.**	**Total, open pit.**	Grand total.
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**		
2	......	7	2	2	......	......	......	......	3	9	**25**	976
......	1	......	......	1	......	......	......	......	......	2	**4**	192
4	1	3	3	2	......	......	3	......	5	9	**30**	3,235
6	......	2	......	1	......	......	2	......	4	5	**20**	1,397
1	......	......	......	......	......	......	......	......	......	1	**2**	427
6	4	1	......	13	......	......	3	1	39	55	**122**	419
......	......	......	......	......	......	......	......	......	......	......	......	959
......	......	......	......	......	......	......	......	......	......	......	......	49
......	......	......	......	......	......	......	......	......	......	......	......	91
......	......	......	......	......	......	......	......	......	......	......	......	641
33	......	......	......	......	1	......	......	......	......	......	**34**	78
2	......	1	......	......	......	3	2	......	5	25	**38**	3,536
33	8	67	70	59	3	3	27	4	79	217	**570**	1,379
33	......	......	......	8	......	......	6	......	9	23	**79**	988
......	......	......	......	......	......	......	......	......	......	......	......	2,497
11	2	10	......	10	......	......	......	......	2	40	**75**	745
......	......	......	......	......	......	......	......	......	......	......	......	194
2	......	1	......	......	......	......	......	1	7	15	**26**	243
5	1	......	1	4	......	......	......	......	3	18	**32**	1,009
1	1	1	......	......	......	......	......	......	1	......	**4**	14
......	......	......	......	......	......	......	......	......	......	......	......	2,009
......	......	......	......	......	......	......	......	......	......	......	......	36
1	......	1	1	3	......	......	1	......	2	3	**12**	21
......	......	......	......	......	......	......	......	......	......	......	......	602
2	1	......	2	2	......	1	......	......	......	2	**10**	378
7	......	1	......	1	......	......	......	......	3	8	**20**	399
47	21	......	4	6	......	......	3	......	......	3	**84**	2,564
3	......	1	......	4	......	......	2	......	2	7	**19**	96
......	......	......	......	......	......	......	......	......	......	......	......	20
2	......	......	......	......	......	......	......	......	......	......	**2**	125
2	......	......	1	3	......	......	......	......	......	......	**6**	24
38	3	4	1	4	......	......	3	......	7	40	**100**	737
241	**43**	**100**	**85**	**123**	4	7	52	**6**	171	**482**	1,314	**26,080**
143	**26**	147	105	145	12	6	56	3	148	562	1,353	18,604

ACCIDENT STATISTICS, BY KINDS OF METAL PRODUCED.

COPPER MINES.

The accident-frequency rate for the copper-mining industry in 1922 was 323.78 accidents for every 1,000 men employed, as against 321.23 in the previous year. (Table 3.) These rates are based on a unit of 300,000 shifts (the equivalent of 1,000 men averaging 300 workdays each during the year). The figure for 1922 includes a fatality rate of 3 and a nonfatal injury rate of 320.78—an injury signifying disability for more than one day. The number of employees killed by accidents was 75, and the number injured was 8,025. Of the 25,739 men working during the year, 17,547 were employed below ground; accidents to these men resulted in a fatality rate of 3.89 and an injury rate of 398.90 per thousand full-year workers. Only 1,119 men were employed in open-pit copper mining, and the accident rates for these men were 4.88 killed and 159.02 injured. Men employed above ground, in shops and yards, numbered 7,073; for these men the fatality rate was 0.31 and the injury rate was 136.22.

Most of the accidents underground were due to falls of rock or ore from roof or wall, haulage, timber or hand tools, loading rock or ore at face, and drilling. For accidents in open pits the main causes were falls or slides of rock or ore, explosives, and falls of persons. Accidents in shops and yards resulted mainly from hand tools, falls of persons, machinery, and haulage. (Tables 21 and 22.)

The total amount of labor performed at copper mines in 1922 was equivalent to 7,504,983 shifts, an increase of 68 per cent over the year 1921 and 33 per cent below the 1920 record. In 1922 each man averaged 292 days of work, that is, each man was exposed to mining hazards that number of days; those employed below ground averaged 299 days; open-pit workers averaged 275 days; and employees at shops and yards averaged 276 days. Of the 8,100 accidents at copper mines during the year, 0.92 per cent were fatal, 0.67 per cent caused permanent partial disability, 26.79 per cent resulted in temporary disability for more than 14 days, and 71.62 per cent disabled the employees for more than the remainder of the shift but not more than 14 days.

GOLD, SILVER, AND MISCELLANEOUS METAL MINES.

Accidents at gold, silver, and miscellaneous metal mines in 1922 showed a frequency rate of 265.64 per 1,000 men employed, as compared with 228.75 in the previous year. (Table 3.) The figure for 1922 includes a fatality rate of 5.35 and an injury rate of 260.29. The actual number of men killed by accidents was 140 and the number injured was 6,805. Of 27,614 men, working at this class of mines during the year, 18,362 men worked underground; accidents to these men resulted in a fatality rate of 7.24 per 1,000 workers and an injury rate of 327.42. The high fatality rate largely was due to the disaster at the Argonaut mine in California in which 47 lives were lost. Only 710 men were employed in open-pit mining, accidents in connection with their work showing no fatalities and an injury rate of 158.27. Surface workers not engaged in actual mining operations numbered 8,542, for whom the fatality rate from accidents was 1.20 and the injury rate was 105.89.

The main causes of accidents to men working underground were falls of rock or ore from roof or wall, timber or hand tools, rock or ore while loading at working face, haulage, drilling; falling down chute, winze, raise, or stope; and stepping on nails. The main causes of accidents to surface workers in shops and yards were falls of persons, hand tools, machinery, and haulage. (Tables 21 and 22.)

The operators' reports showed a total of 7,843,280 man-days of labor performed during the year, an increase of about 10 per cent as compared with 1921 but about 6 per cent below the figure for 1920. This total for all employees in 1922 indicates an average of 284 work-days per man. The underground workers averaged 296 days; those in open pits 235 days; and employees in shops and yards 263 days.

Of the 6,945 accidents at this group of mines during the year, 2.02 per cent were fatal, 0.01 per cent resulted in permanent total disability, 0.98 per cent in permanent partial disability, 24.05 per cent in temporary disability lasting more than 14 days, and 72.94 per cent in disability for 1 to 14 days.

IRON MINES.

Accidents to men employed at iron mines in 1922 resulted in a frequency rate of 180.44 per 1,000 employees as compared with 213.95 for 1921. (Table 3.) The 1922 figure includes a fatality rate of 3.00 and an injury rate of 177.44. For men working underground the fatality rate was 4.20 and the injury rate was 243.09; for open-pit workers the fatality rate was 2.26 and the injury rate was 90.69; for men employed in surface shops and yards the fatality rate was 0.69 and the injury rate was 103.96. Each of these rates is lower than the corresponding rate for the previous year.

Accidents to workers underground were caused mainly by fall of rock or ore from roof or wall, haulage, timber or hand tools, rock or ore while loading at working face, and drilling. Open-pit workers were injured most frequently by haulage, steam shovels, hand tools, and falls of persons. Accidents to surface employees were due mainly to hand tools, falls of persons, machinery, haulage, and stepping on nails. (Tables 21 and 22.)

Of the 4,984 accidents during the year, 1.67 were fatal, 0.06 per cent resulted in permanent total disability, 1.04 per cent in permanent partial disability, 30.78 per cent in temporary disability for more than 14 days, and 66.45 per cent in disability of 1 to 14 days.

The average number of employees at iron mines during the year was 32,241, of whom 17,596 worked underground, 7,930 in open-pit mining, and 6,715 in surface shops. The volume of work performed by all employees was 8,286,225 man-days, an increase of 29 per cent over the previous year, but a decrease of 39 per cent from the 1920 record. The average working time per man was 257 days; for underground men the average was 260 days, for open-pit workers 251 days, and for surface employees 257 days.

LEAD AND ZINC MINES.

The accident-frequency rate for mines producing lead and zinc in the Mississippi Valley (including fluorspar mines in the same district) was 466.87 per 1,000 employees in 1922 as compared with 382.25 in the preceding year. (Table 3.) Included in the 1922 figures is a fatality rate of 2.64 and an injury rate of 464.23. For men employed underground the fatality rate was 3.51 and the injury rate was 554.05; while for those working above ground, in shops and yards, there were no fatalities and the injury rate was 157.22.

The principal causes of accidents to men working underground at the mines were, rock or ore while loading at working face, fall of rock or ore from roof or wall, haulage, and drilling. Accidents to surface workers resulted mainly from hand tools, machinery, run or fall of ore in or from ore bins, stepping on nail, and haulage. (Tables 21 and 22.)

The total number of employees during the year was 8,990, of whom 6,747 worked underground, 2,193 on the surface, and 50 at open pits. A total of 2,499,531 shifts was worked during the year, an increase of 53 per cent over the previous year. The average number of workdays was 278 per man; the underground workers averaged 278 days; those at shops and yards 278 days, and those working in open pits 240 days. Of the 3,890 accidents during the year, 0.56 per cent caused death, 0.13 per cent caused permanent total disability, 0.85 per cent permanent partial disability, 19.18 per cent resulted in temporary disability lasting more than 14 days, 79.28 per cent in disability of 1 to 14 days.

NONMETALLIC MINERAL MINES.

Accidents at mines producing nonmetallic minerals showed a frequency rate of 249.90 per 1,000 employees (300-day workers), as compared with the previous year's rate of 217.45. (Table 3.)

The figure for 1922 includes a fatality rate of 2.39 and an injury rate of 247.51. Accidents to employees underground resulted in a fatality rate of 5.43 and an injury rate of 277.17; for open-pit workers the rates were 1.42 killed and 135.75 injured; for employees in shops and yards the fatality rate was 1.45 and the injury rate was 298.05.

Accidents underground were due largely to rock or ore while loading at working face, haulage, fall of rock or ore from roof or wall, and drilling. Most of the accidents in open-pit mining resulted from falls or slides of rock or ore, hand tools, and falls of persons. Accidents in surface shops and yards were caused mainly by hand tools, falls of persons, stepping on nail, and machinery. (Tables 21 and 22.)

Men employed at nonmetallic mineral mines in 1922 numbered 11,113 of whom 2,530 worked underground, 3,275 in open-pit mines, and 5,308 in shops and yards.

A total of 3,007,274 shifts was worked by all employees, representing an increase of 10 per cent over 1921 and a decrease of 24 per cent below 1920. The average working time per man during the year was 271 days for all employees, 284 days for employees underground, 258 days for open-pit workers, and 272 days for employees in surface shops and yards.

Of the 2,505 accidents at the group of mines, 0.96 per cent were fatal, 0.96 per cent resulted in permanent partial disability, 15.61 per cent caused temporary disability lasting more than 14 days, and 82.47 per cent caused disability of more than the remainder of the shift but not to exceed 14 days.

TABLE 11.—*COPPER MINES: Men employed and days worked, by States, during the year ended December 31, 1922.*

State.	Active operators.	Men employed.				Days of labor performed.				Average days active.			
		Underground.	Surface.	Open pit.	**Total.**	Underground.	Surface.	Open pit.	**Total.**	Underground.	Surface.	Open pit.	**Total.**
Alaska	12	282	165	46	**493**	102,366	59,895	16,698	**178,959**	363	363	363	**363**
Arizona	90	5,799	1,658	354	**7,811**	1,793,882	492,304	102,243	**2,388,429**	309	297	289	**306**
California	11	373	125	6	**504**	128,370	42,643	402	**171,415**	344	341	67	**340**
Idaho	28	147	36	2	**185**	41,399	9,392	400	**51,191**	282	261	200	**277**
Michigan	13	3,825	2,907	....	**6,732**	1,091,012	748,481	....	**1,839,493**	285	257	....	**273**
Montana	23	5,752	1,471	....	**7,223**	1,731,844	430,231	....	**2,162,075**	301	292	....	**299**
Nevada	19	294	183	109	**586**	40,963	22,807	26,010	**89,780**	139	125	239	**153**
New Mexico	18	254	142	244	**640**	76,412	38,560	66,620	**181,592**	301	272	273	**284**
Oregon	8	47	11	....	**58**	8,400	2,005	....	**10,405**	179	182	....	**179**
Utah	17	310	169	349	**828**	103,763	51,424	93,881	**249,068**	335	304	269	**301**
Washington	18	43	47	9	**99**	6,058	7,758	1,200	**15,016**	141	165	133	**152**
Other States	17	421	159	....	**580**	121,825	45,735	....	**167,560**	289	288	......	**289**
Total, 1922	**274**	**17,547**	**7,073**	**1,119**	**25,739**	**5,246,294**	**1,951,235**	**307,454**	**7,504,983**	**299**	**276**	**275**	**292**
Total, 1921	357	12,865	4,770	665	**18,300**	3,258,838	1,084,833	117,625	**4,461,296**	253	227	177	**244**

TABLE 12.—*COPPER MINES: Number of 300-day workers and number killed and injured during the year ended December 31, 1922.*

State.	Number of 300-day workers.				Number killed.				Number injured.				Widows.	Orphans.
	Underground.	Surface.	Open pit.	**Total.**	Underground.	Surface.	Open pit.	**Total.**	Underground.	Surface.	Open pit.	**Total.**		
Alaska	341	200	56	**597**	2	....	....	**2**	83	22	4	**109**	....	....
Arizona	5,980	1,641	341	**7,962**	21	....	....	**21**	2,838	274	30	**3,142**	7	13
California	428	142	1	**571**	1	....	....	**1**	113	12	....	**125**	....	....
Idaho	138	31	1	**170**	....	....	....	....	1	1	....	**2**	....	....
Michigan	3,637	2,495	....	**6,132**	10	....	....	**10**	1,603	176	....	**1,779**	6	16
Montana	5,773	1,434	....	**7,207**	24	....	....	**24**	1,703	107	....	**1,810**	1	1
Nevada	136	76	87	**299**	3	1	....	**4**	120	17	19	**156**	....	....
New Mexico	255	129	222	**606**	4	....	1	**5**	64	63	26	**153**	2	....
Oregon	28	7	....	**35**	....	....	....	....	15	2	....	**17**	....	....

Utah	346	171	313	830	1		4	5	291	205	84	580		
Washington	20	26	4	50										
Other States	406	152		558	2	1		3	145	7		152	3	6
Total, 1922	**17,488**	**6,504**	**1,025**	**25,017**	**68**	**2**	**5**	**75**	**6,976**	**886**	**163**	**8,025**	**19**	**36**
Total, 1921	10,863	3,616	392	14,871	49	6		55	4,073	495	154	4,722	27	39

TABLE 13.—*GOLD, SILVER, AND MISCELLANEOUS METAL MINES: Men employed and days worked, by States, during the year ended December 31, 1922.*

State.	Active operators.	Men employed.				Days of labor performed.				Average days active.			
		Underground.	Surface.	Open pit.	**Total.**	Underground.	Surface.	Open pit.	**Total.**	Underground.	Surface.	Open pit.	**Total.**
Alaska	590	685	2,105		**2,790**	182,159	402,684		**584,843**	266	191		**210**
Arizona	120	770	250	14	**1,034**	216,573	64,203	995	**281,771**	281	257	71	**273**
California	201	2,571	1,687	49	**4,307**	724,987	490,605	10,562	**1,226,154**	282	291	216	**285**
Colorado	222	2,355	697	20	**3,072**	657,794	197,063	2,005	**856,862**	279	283	100	**279**
Georgia [1]													
Idaho	224	2,603	980	6	**3,589**	672,100	242,458	1,240	**915,798**	258	247	207	**255**
Montana	114	1,975	514	4	**2,493**	633,059	155,353	476	**788,888**	321	302	119	**316**
Nevada	181	1,744	524	75	**2,343**	537,391	164,267	17,951	**719,609**	308	313	239	**307**
New Mexico	35	374	107	9	**490**	94,482	16,520	500	**111,502**	253	154	56	**228**
New York [1]													
North Carolina [1]													
Oregon	62	129	102	8	**239**	28,099	21,823	720	**50,642**	218	214	90	**212**
South Dakota	19	953	703	18	**1,674**	309,250	232,320	5,818	**547,388**	325	330	323	**327**
Tennessee [1]													
Utah	86	3,171	552	10	**3,733**	1,074,408	181,329	1,800	**1,257,537**	339	328	180	**337**
Virginia [1]													
Washington	62	189	58	6	**253**	38,681	10,552	640	**49,873**	205	182	107	**197**
Wyoming	11	13	11	2	**26**	1,075	1,080	250	**2,405**	83	98	125	**93**
Other States	15	830	252	489	**1,571**	256,750	69,480	123,778	**450,008**	309	276	253	**286**
Total, 1922	**1,942**	**18,362**	**8,542**	710	**27,614**	**5,426,808**	**2,249,737**	**166,735**	**7,843,280**	**296**	**263**	**235**	**284**
Total, 1921	2,135	17,642	8,197	677	**26,516**	4,963,389	2,023,301	134,712	**7,121,402**	281	247	199	**269**

[1] Not segregated.

Original from UNIVERSITY OF MICHIGAN

TABLE 14.—*GOLD, SILVER, AND MISCELLANEOUS METAL MINES:* *Number of 300-day workers and number killed and injured during the year ended December 31, 1922.*

State.	Number of 300-day workers.				Number killed.				Number injured.				Widows.	Orphans.
	Under-ground.	Surface.	Open pit.	**Total.**	Under-ground.	Surface.	Open pit.	**Total.**	Under-ground.	Surface.	Open pit.	**Total.**		
Alaska	607	1,342		**1,949**	2			**2**	68	15		**83**		
Arizona	722	214	3	**939**	2			**2**	82	11		**93**	1	4
California	2,417	1,635	35	**4,087**	58	4		**62**	1,005	190	1	**1,196**	15	25
Colorado	2,193	657	6	**2,856**	11	1		**12**	340	79		**419**	3	5
Georgia [1]														
Idaho	2,240	808	4	**3,052**	9			**9**	838	103		**941**	2	4
Montana	2,110	518	2	**2,630**	7	1		**8**	654	28		**682**	2	4
Nevada	1,791	548	60	**2,399**	4	2		**6**	445	79	6	**530**	2	4
New Mexico	315	55	2	**372**	3			**3**	9	5		**14**	3	7
New York [1]														
North Carolina [1]														
Oregon	94	73	2	**169**					16	3		**19**		
South Dakota	1,031	774	20	**1,825**	5			**5**	538	64		**602**	2	5
Tennessee [1]														
Utah	3,582	604	6	**4,192**	20	1		**21**	1,765	195		**1,960**	8	16
Virginia [1]														
Washington	129	35	2	**166**	3			**3**	13	7		**20**		
Wyoming	3	4	1	**8**										
Other States	856	231	413	**1,500**	7			**7**	150	15	81	**246**	4	5
Total, 1922	**18,090**	**7,498**	**556**	**26,144**	**131**	**9**		**140**	**5,923**	**794**	**88**	**6,805**	**42**	**79**
Total, 1921	16,545	6,744	449	**23,738**	66	12		**78**	4,439	877	36	**5,352**	25	34

[1] Not segregated.

TABLE 15.—*IRON MINES:* *Men employed and days worked, by States, during the year ended December 31, 1922.*

State.	Active oper-tors.	Men employed.				Days of labor performed.				Average days active.			
		Under-ground.	Surface.	Open pit.	**Total.**	Under-ground.	Surface.	Open pit.	**Total.**	Under-ground.	Surface.	Open pit.	**Total.**
Alabama	13	4,091	1,133	971	**6,195**	1,053,505	293,611	274,266	**1,621,382**	258	259	282	**262**
Georgia [1]													

Michigan	27	7,125	2,939	357	10,421	1,953,745	793,462	70,705	2,817,912	274	270	198	270
Minnesota	36	4,099	1,608	6,109	11,816	1,065,333	396,629	1,557,310	3,019,272	260	247	255	256
Missouri[1]													
New Jersey[1]													
New Mexico[1]													
New York	6	732	311		1,043	152,963	68,033		220,996	209	219		212
Pennsylvania[1]													
Tennessee	4	239	26	245	510	59,750	6,500	37,758	104,008	250	250	154	204
Virginia	5	43	20	68	131	5,377	4,005	2,645	12,027	125	200	39	92
Wisconsin	4	639	255		894	148,022	61,263		209,285	232	240		234
Other States	15	628	423	180	1,231	127,628	104,949	48,766	281,343	203	248	271	229
Total, 1922	**110**	**17,596**	**6,715**	**7,930**	**32,241**	**4,566,323**	**1,728,452**	**1,991,450**	**8,286,225**	**260**	**257**	**251**	**257**
Total, 1921	122	17,501	7,102	5,956	30,559	3,434,610	1,462,242	1,513,721	6,410,573	196	206	254	210

[1] Not segregated.

TABLE 16.—***IRON MINES:*** *Number of 300-day workers and number killed and injured during the year ended December 31, 1922.*

State.	Number of 300-day workers.				Number killed.				Number injured.				Widows.	Orphans.
	Underground.	Surface.	Open pit.	**Total.**	Underground.	Surface.	Open pit.	**Total.**	Underground.	Surface.	Open pit.	**Total.**		
Alabama	3,512	979	914	**5,405**	15	1	1	**17**	894	57	23	**974**	10	11
Georgia[1]														
Michigan	6,512	2,645	236	**9,393**	22	1		**23**	1,471	196	29	**1,696**	16	32
Minnesota	3,551	1,322	5,191	**10,064**	16	2	13	**31**	711	95	525	**1,331**	22	47
Missouri[1]														
New Jersey[1]														
New Mexico[1]														
New York	510	227		**737**	6			**6**	395	198		**593**	4	17
Pennsylvania[1]														
Tennessee	199	22	126	**347**							6	**6**		
Virginia	18	13	9	**40**					2	3	2	**7**		
Wisconsin	493	204		**697**	1			**1**	87	15		**102**		
Other States	426	350	162	**938**	4		1	**5**	140	35	17	**192**	5	11
Total, 1922	**15,221**	**5,762**	**6,638**	**27,621**	**64**	**4**	**15**	**83**	**3,700**	**599**	**602**	**4,901**	**57**	**118**
Total, 1921	11,449	4,874	5,046	**21,369**	45	6	14	**65**	3,126	630	751	**4,507**	43	108

[1] Not segregated.

TABLE 17.—***LEAD AND ZINC MINES:*** (*Mississippi Valley*): *Men employed and days worked, by States, during the year ended December 31, 1922.*

State.	Active oper-tors.	Men employed.				Days of labor performed.				Average days active.			
		Under-ground.	Su.face.	Open pit.	**Total.**	Under-ground.	Surface.	Open pit.	**Total.**	Under-ground.	Surface.	Open pit.	**Total.**
Arkansas [1]													
Illinois	5	306	248	15	**569**	79,016	66,350	3,000	**148,366**	255	268	200	**261**
Kansas	14	940	192		**1,132**	247,043	47,320		**294,363**	263	246		**260**
Missouri	9	2,641	1,135	30	**3,806**	799,822	335,638	8,190	**1,143,650**	303	296	273	**300**
Oklahoma	32	2,434	478		**2,912**	653,089	122,887		**775,976**	268	257		**266**
Tennessee [1]													
Wisconsin	5	94	39		**133**	21,275	9,316		**30,591**	226	239		**230**
Other States	9	332	101	5	**438**	78,730	27,055	800	**106,585**	237	268	160	**243**
Total, 1922	**74**	**6,747**	**2,193**	**50**	**8,990**	**1,878.975**	**608,566**	**11,990**	**2,499,531**	**278**	**278**	**240**	**278**
Total, 1921	66	5,302	1,616	30	**6,948**	1,259,899	364,142	5,150	**1,629,191**	238	225	172	**234**

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[1] Not segregated.

TABLE 18.—***LEAD AND ZINC MINES:*** *(Mississippi Valley): Number of 300-day workers and number killed and injured during the year ended December 31, 1922.*

State.	Number of 300-day workers.				Number killed.				Number injured.				Widows.	Orphans.
	Underground.	Surface.	Open pit.	**Total.**	Underground.	Surface.	Open pit.	**Total.**	Underground.	Surface.	Open pit.	**Total.**		
Arkansas[1]														
Illinois	264	221	10	**495**	3			**3**	37	12		**49**	2	7
Kansas	823	158		**981**	1			**1**	583	39		**622**		
Missouri	2,666	1,119	27	**3,812**	9			**9**	844	37	79	**960**	9	14
Oklahoma	2,177	410		**2,587**	6			**6**	1,776	215		**1,991**	4	4
Tennessee[1]														
Wisconsin	71	31		**102**	2			**2**	14	7		**21**		
Other States	262	90	3	**355**	1			**1**	216	9		**225**		
Total, 1922	**6,263**	**2,029**	**40**	**8,332**	**22**			**22**	**3,470**	**319**	**79**	**3,868**	**15**	**25**
Total, 1921	4,200	1,214	17	**5,431**	14			**14**	1,875	184	3	**2,062**	9	**32**

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[1] **Not segregated.**

TABLE 19.—*NONMETALLIC MINERAL MINES: Men employed and days worked, by States, during the year ended December 31, 1922.*

State.	Active operators.	Men employed.				Days of labor performed.				Average days active.			
		Underground.	Surface.	Open pit.	**Total.**	Underground.	Surface.	Open pit.	**Total.**	Underground.	Surface.	Open pit.	**Total.**
California	31	236	93	77	**406**	71,660	28,965	22,736	**123,361**	304	311	295	**304**
Florida	13	....	964	795	**1,759**	....	242,702	195,244	**437,946**	....	252	246	**249**
Georgia	6	13	18	62	**93**	3,610	4,186	17,008	**24,804**	278	233	274	**267**
Iowa	6	219	54	....	**273**	55,820	13,771	....	**69,591**	255	255	....	**255**
Maine [1]	....	....	....	....	....	....	....	....	....	....	....	....	....
Michigan	3	85	6	59	**150**	23,680	1,500	17,120	**42,300**	279	250	290	**282**
Missouri	5	42	18	319	**379**	13,146	4,504	95,745	**113,395**	313	250	300	**299**
New York	14	899	479	159	**1,537**	268,180	139,116	23,653	**430,949**	298	290	149	**280**
North Carolina	9	41	43	162	**246**	7,209	11,199	45,675	**64,083**	176	260	282	**261**
Pennsylvania	8	53	38	83	**174**	15,392	10,680	18,897	**44,969**	290	281	228	**258**
Tennessee	9	10	445	279	**734**	2,000	99,484	62,275	**163,759**	200	224	223	**223**
Texas	9	....	1,193	172	**1,365**	....	277,385	55,255	**332,640**	....	233	321	**244**
Utah	7	85	42	4	**131**	21,449	10,817	1,400	**33,666**	252	258	350	**257**
Vermont	4	29	18	8	**55**	8,850	5,300	1,840	**15,990**	305	294	230	**291**
Virginia	6	149	685	159	**993**	41,175	202,200	46,300	**289,675**	276	295	291	**292**
Other States	69	669	1,212	937	**2,818**	185,490	393,562	241,094	**820,146**	277	325	257	**291**
Total, 1922	**199**	**2,530**	**5,308**	**3,275**	**11,113**	**717,661**	**1,445,371**	**844,242**	**3,007,274**	**284**	**272**	**258**	**271**
Total, 1921	216	2,630	4,433	4,543	**11,606**	642,532	1,133,469	954,239	**2,730,240**	244	256	210	**235**

[1] Not segregated.

TABLE 20.—*NONMETALLIC MINERAL MINES: Number of 300-day workers and number killed and injured during the year ended December 31, 1922.*

State.	Number of 300-day workers.				Number killed.				Number injured.				Widows.	Orphans.
	Under-ground.	Surface.	Open pit.	**Total.**	Under-ground.	Surface.	Open pit.	**Total.**	Under-ground.	Surface.	Open pit.	**Total.**		
California	239	96	76	**411**	1			**1**	47	10	19	**76**		
Florida		809	651	**1,460**		2	2	**4**		297	122	**419**	3	3
Georgia	12	14	57	**83**										
Iowa	186	46		**232**					60	31		**91**		
Maine [1]														
Michigan	79	5	57	**141**	1			**1**	33	19	9	**61**	1	2
Missouri	44	15	319	**378**	1			**1**	4			**4**	1	
New York	894	464	79	**1,437**	6	2	1	**9**	316	68	32	**416**	3	14
North Carolina	24	37	152	**213**					2	4	4	**10**		
Pennsylvania	51	36	63	**150**	1			**1**	4	3		**7**		
Tennessee	7	332	207	**546**						27	4	**31**		
Texas		925	184	**1,109**		2		**2**		375	20	**395**	2	4
Utah	71	36	5	**112**					10	1		**11**		
Vermont	30	17	6	**53**	1			**1**	15	6		**21**		
Virginia	137	674	154	**965**	1			**1**	39	32	16	**87**	1	3
Other States	618	1,312	804	**2,734**	1	1	1	**3**	133	563	156	**852**	2	3
Total, 1922	**2,392**	**4,818**	**2,814**	**10,024**	13	7	**4**	**24**	**663**	**1,436**	**382**	**2,481**	13	**29**
Total, 1921	2,142	3,778	3,181	**9,101**	8	4	6	**18**	627	925	409	**1,961**	8	19

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[1] Not segregated.

TABLE 21.—*ALL MINES: Fatalities and injuries, by causes*

NUMBER KILLED.

Kind of Mine	Underground.									
	Fall of rock or ore from roof or wall.	Rock or ore while loading at working face.	Timber or hand tools.	Explosives.	Haulage accidents.	Falling down chute, winze, raise or stope.	Run of ore from chute or pocket.	Drilling accidents.	Electricity.	Machinery (not including locomotives or drills).
	1	2	3	4	5	6	7	8	9	10
Copper	30	1	......	2	10	7	3	......	......	......
Gold, silver, and miscellaneous metal	27	1	1	14	4	19	3	1	1	......
Iron	31	1	1	3	8	5	1	1	1	2
Lead and zinc (Mississippi Valley)	10	......	......	2	2	1	......	......	......	......
Nonmetallic mineral	3	......	......	6	1	......	......	2	......	......
Total, 1922	**101**	**3**	**2**	**27**	**25**	**32**	**7**	**4**	**2**	**2**
Percentage of grand total killed	29.36	.87	.58	7.85	7.27	9.30	2.04	1.16	.58	.58
Percentage of class total killed	39.14	1.16	.78	10.46	9.69	12.40	2.71	1.55	.78	.78
Number killed per 1,000 300-day workers employed underground	1.70	.05	.03	.45	.42	.54	.12	.07	.03	.03

NUMBER INJURED.

Copper	1,578	736	797	112	914	219	189	454	29	31
Gold, silver, and miscellaneous metal	1,825	561	632	109	483	260	79	474	39	60
Iron	690	554	568	42	639	118	60	214	33	67
Lead and zinc (Mississippi Valley)	612	901	80	18	458	48	11	313	22	70
Nonmetallic mineral	59	224	28	46	95	3	4	49	11	11
Total, 1922	**4,764**	**2,976**	**2,105**	**327**	**2,589**	**648**	**343**	**1,504**	**134**	**239**
Percentage of grand total injured	18.27	11.41	8.07	1.25	9.93	2.48	1.32	5.77	.51	.92
Percentage of class total injured	23.91	14.94	10.57	1.64	13.00	3.25	1.72	7.55	.67	1.20
Number injured per 1,000 300-day workers employed underground	80.13	50.05	35.40	5.50	50.27	10.90	5.77	25.30	2.25	4.02

1911-1921

Fatalities, 1911 to 1921:										
Number (total United States)	1,970	82	48	637	319	430	94	16	133	25
Percentage of grand total.	30.45	1.27	.74	9.85	4.93	6.65	1.45	.25	2.05	.39
Injuries, 1911 to 1921:										
Number (total United States)	73,456	39,593	32,298	4,697	40,728	9,507	7,745	18,867	744	4,070
Percentage of grand total.	19.54	10.53	8.59	1.25	10.83	2.53	2.06	5.02	.20	1.08

and kinds of mines, during the year ended December 31, 1922.

NUMBER KILLED.

Underground.						Shaft.						
Mine fires.	Suffocation from natural gases.	Inrush of water.	Stepping on nail.	Other causes.	**Total, underground.**	Falling down shafts.	Objects falling down shafts.	Breaking of cables.	Overwinding.	Skip or cage.	Other causes.	**Total, shaft.**
11	**12**	**13**	**14**	**15**		**16**	**17**	**18**	**19**	**20**	**21**	
....	....	....	....	2	**55**	2	1	....	....	8	2	**13**
47	1	....	....	1	**120**	3	3	....	....	4	1	**11**
....	....	....	....	1	**55**	3	1	3	....	1	1	**9**
....	....	....	....	....	**15**	4	1	....	....	2	....	**7**
....	....	....	....	1	**13**	....	....	....	....	....	....	....
47	**1**	....	....	**5**	**258**	**12**	**6**	**3**	....	**15**	**4**	**40**
13.66	.29	....	....	1.46	**75.00**	3.49	1.75	.87	....	4.36	1.16	**11.63**
18.22	.39	....	....	1.94	**100.00**	30.00	15.00	7.50	....	37.50	10.00	**100.00**
.79	.02	....	....	.08	**4.34**	.20	.10	.05	....	.25	.07	**.67**

NUMBER INJURED.

1	5	....	171	1,435	**6,671**	18	78	1	....	75	133	**305**
5	8	....	235	954	**5,724**	19	48	2	1	67	62	**199**
....	7	....	110	519	**3,621**	9	19	1	....	17	33	**79**
....	3	....	55	661	**3,252**	6	58	....	1	41	112	**218**
....	....	....	4	119	**653**	1	1	....	....	4	4	**10**
6	**23**	....	**575**	**3,688**	**19,921**	**53**	**204**	**4**	**2**	**204**	**344**	**811**
.02	.09	....	2.20	14.14	**76.38**	.20	.78	.02	.01	.78	1.32	**3.11**
.03	.12	....	2.89	18.51	**100.00**	6.54	25.15	.49	.25	25.15	42.42	**100.00**
.10	.38	....	9.67	62.03	**335.07**	.89	3.43	.07	.03	3.43	5.79	**13.64**

1911-1921.

247 3.82	50 .77	53 .82	4 .06	145 2.24	**4,253** **65.74**	392 6.06	144 2.23	24 .37	20 .31	307 4.75	107 1.65	**994** **15.37**
242 .06	506 .14	246 .07	5,316 1.42	48,979 13.03	**286,994** **76.35**	890 .24	2,892 .77	101 .03	85 .02	2,764 .73	2,821 .75	**9,553** **2.54**

TABLE 21.—***ALL MINES:*** *Fatalities and injuries, by causes*

NUMBER KILLED.

Kind of Mine	Surface.									
	Mine cars, mine locomotives, or aerial trams.	Railway cars and locomotives.	Run or fall of ore in or from ore bins.	Falls of persons.	Stepping on nail.	Hand tools, axes, bars, etc.	Electricity.	Machinery.	Other causes.	**Total, surface.**
	22	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	
Copper	......	1	......	......	......	......	......	......	1	**2**
Gold, silver, and miscellaneous metal	1	......	......	2	......	......	1	2	3	**9**
Iron	......	2	......	......	......	......	......	1	1	**4**
Lead and zinc (Mississippi Valley)	......	......	......	......	......	......	......	......	......	......
Nonmetallic mineral	......	1	......	1	......	......	2	1	2	**7**
Total, 1922	**1**	**4**	......	**3**	......	......	**3**	**4**	**7**	**22**
Percentage of grand total killed	.29	1.16	......	.87	......	......	.87	1.16	2.04	**6.39**
Percentage of class total killed	4.54	18.18	......	13.64	......	......	13.64	18.18	31.82	**100.00**
Number killed per 1,000 300-day workers employed on the surface and in the pit	.04	.15	......	.11	......	......	.11	.15	.26	**.83**

NUMBER INJURED.

Kind of Mine	22	23	24	25	26	27	28	29	30	Total, surface.
Copper	40	65	9	109	43	110	10	70	430	**886**
Gold, silver, and miscellaneous metal	53	36	17	127	37	116	23	99	286	**794**
Iron	36	18	17	75	35	100	14	71	233	**599**
Lead and zinc (Mississippi Valley)	19	11	29	13	25	40	......	30	152	**319**
Nonmetallic mineral	17	47	3	135	120	149	10	108	847	**1,436**
Total, 1922	**165**	**177**	**75**	**459**	**260**	**515**	**57**	**378**	**1,948**	**4,034**
Percentage of grand total injured	.63	.68	.29	1.76	1.00	1.97	.22	1.45	7.47	**15.47**
Percentage of class total injured	4.09	4.39	1.86	11.38	6.44	12.77	1.42	9.37	48.29	**100.00**
Number injured per 1,000 300-day workers employed on the surface and in the pit	6.20	6.65	2.82	17.25	9.77	19.35	2.14	14.21	73.20	**151.59**

1911-1921.

Kind of Mine	22	23	24	25	26	27	28	29	30	Total, surface.
Fatalities, 1911 to 1921:										
Number (total United States)	61	69	20	69	3	4	54	82	217	**579**
Percentage of grand total	.94	1.07	.31	1.07	.05	.06	.83	1.27	3.35	**8.95**
Injuries, 1911 to 1921:										
Number (total United States)	3,069	1,406	988	4,875	2,853	6,601	474	5,252	20,838	**46,356**
Percentage of grand total	.82	.37	.26	1.30	.76	1.76	.12	1.40	5.54	**12.38**

and kinds of mines, during the year ended December 31, 1922—Continued.

NUMBER KILLED.

Open pit.												
Falls or slides of rock or ore.	Explosives.	Haulage accidents (locomotives, etc.).	Steam shovels.	Falls of persons.	Falls of derricks, booms, etc.	Run or fall of ore in or from ore bins.	Machinery (other than locomotives or steam shovels).	Electricity.	Hand tools.	Other causes.	Total, open pit.	Grand total.
31	32	33	34	35	36	37	38	39	40	41		
......	2	1	......	......	......	......	......	......	......	2	5	75
......	......	......	......	......	......	......	......	......	......	......	......	140
4	......	6	1	1	......	......	......	......	......	3	15	83
......	......	......	......	......	......	......	......	......	......	......	......	22
......	1	......	......	......	......	......	......	2	......	1	4	24
4	3	7	1	1	......	......	......	2	......	6	24	344
1.16	.87	2.04	.29	.29	......	......	......	.58	......	1.75	6.98	100.00
16.67	12.50	29.17	4.16	4.16	......	......	......	8.33	......	25.00	100.00	......
.36	.27	.63	.09	.09	......	......	......	.18	......	.54	2.16	3.54
NUMBER INJURED.												
55	24	6	7	14	......	......	6	1	12	38	163	8,025
21	1	10	4	8	......	2	3	2	25	12	88	6,805
41	9	69	72	64	3	4	28	2	72	238	602	4,901
33	......	......	......	8	......	......	6	......	9	23	79	3,868
91	9	15	2	29	1	1	9	1	53	171	382	2,481
241	43	100	85	123	4	7	52	6	171	482	1,314	26,080
.92	.16	.38	.33	.47	.02	.03	.20	.02	.66	1.85	5.04	100.00
18.34	3.27	7.61	6.47	9.36	.31	.53	3.96	.46	13.01	36.68	100.00	......
21.77	3.88	9.03	7.67	11.11	.36	.63	4.70	.54	15.44	43.53	118.67	268.48
1911-1921.												
161	147	169	28	27	10	2	33	20	......	46	643	6,469
2.49	2.27	2.61	.43	.42	.16	.04	.51	.31	......	.71	9.94	100.00
5,335	1,148	3,815	2,457	2,962	293	144	1,818	91	3,280	11,657	33,000	375,963
1.42	.30	1.01	.68	.79	.08	.04	.48	.02	.87	3.10	8.78	100.00

TABLE 22.—*ALL MINES: Percentages of fatalities and injuries, by causes and kinds of mines, during the year ended December 31, 1922.*

Causes.	Percentage killed.							Percentage injured.						
	Copper.	Gold, silver, and miscellaneous metal.	Iron.	Lead and zinc (Mississippi Valley).	Nonmetallic mineral.	**Total.**		Copper.	Gold, silver, and miscellaneous metal.	Iron.	Lead and zinc (Mississippi Valley).	Nonmetallic mineral.	**Total.**	
						1922	**1921**						**1922**	**1921**
Underground:														
1. Fall of rock or ore from roof or wall	40.00	19.28	37.35	45.45	12.49	**29.36**	**29.57**	19.66	26.82	14.08	15.82	2.38	**18.27**	**14.60**
2. Rock or ore while loading at working face or chute	1.33	.72	1.20			**.87**	**.87**	9.17	8.25	11.30	23.29	9.03	**11.41**	**12.38**
3. Timber or hand tools		.72	1.20			**.58**	**.43**	9.93	9.29	11.59	2.07	1.13	**8.07**	**7.99**
4. Explosives	2.67	9.99	3.62	9.09	24.99	**7.85**	**8.70**	1.40	1.60	.86	.47	1.85	**1.25**	**1.25**
5. Haulage system (mine cars, mine locomotives, breakage of rope, etc.)	13.33	2.85	9.64	9.09	4.17	**7.27**	**3.91**	11.39	7.10	13.04	11.84	3.83	**9.93**	**9.94**
6. Falling down chute, winze, raise, or stope	9.33	13.57	6.03	4.55		**9.30**	**5.65**	2.73	3.82	2.41	1.24	.12	**2.48**	**2.69**
7. Run of ore from chute or pocket	4.00	2.14	1.20			**2.04**	**2.17**	2.36	1.16	1.22	.28	.16	**1.32**	**1.17**
8. Drilling accidents (by machine or hand drills)		.72	1.20		8.33	**1.16**		5.66	6.97	4.37	8.09	1.98	**5.77**	**6.21**
9. Electricity		.72	1.20			**.58**	**.87**	.36	.57	.67	.57	.44	**.51**	**.31**
10. Machinery (other than locomotives or drills)			2.41			**.58**		.39	.88	1.37	1.81	.44	**.92**	**1.06**
11. Mine fires		33.57				**13.66**		.01	.07				**.02**	
12. Suffocation from natural gases		.72				**.29**	**2.17**	.06	.12	.14	.08		**.09**	**.17**
13. Inrush of water														
14. Nails, splinters, etc								2.13	3.45	2.24	1.42	.16	**2.20**	**1.84**
15. Other causes	2.67	.72	1.20		4.17	**1.46**	**4.79**	17.88	14.02	10.59	17.09	4.80	**14.14**	**14.03**
Total underground	**73.33**	**85.71**	**66.27**	**68.18**	**54.16**	**75.00**	**59.13**	**83.13**	**84.12**	**73.88**	**84.07**	**26.32**	**76.38**	**73.64**
Shaft:														
16. Falling down shafts	2.67	2.14	3.62	18.18		**3.49**	**9.57**	.22	.28	.18	.16	.04	**.20**	**.28**
17. Objects falling down shafts	1.33	2.14	1.20	4.55		**1.75**	**3.04**	.97	.71	.39	1.50	.04	**.78**	**.61**
18. Breaking of cables			3.62			**.87**		.01	.03	.02			**.02**	
19. Overwinding									.01		.02		**.01**	**.01**
20. Skip, cage, or bucket	10.67	2.86	1.20	9.09		**4.36**	**6.96**	.94	.98	.35	1.06	.16	**.78**	**.75**
21. Other causes	2.67	.72	1.20			**1.16**	**.43**	1.66	.91	.67	2.90	.16	**1.32**	**.72**
Total shaft	**17.33**	**7.86**	**10.84**	**31.82**		**11.63**	**20.00**	**3.80**	**2.92**	**1.61**	**5.64**	**.40**	**3.11**	**2.37**

Surface (at surface yards and shops):														
22. Mine cars or mine locomotives, gravity or aerial trams		.72				.29	2.61	.50	.78	.73	.49	.69	.63	.57
23. Railway cars and locomotives	1.33		2.41		4.17	1.16	.43	.81	.53	.37	.29	1.89	.68	.45
24. Run or fall of ore in or from ore bins								.11	.25	.35	.75	.12	.29	.19
25. Falls of persons		1.42			4.17	.87	2.17	1.36	1.87	1.53	.34	5.44	1.76	1.80
26. Nails, splinters, etc								.54	.54	.71	.65	4.84	1.00	1.36
27. Hand tools, axes, bars, etc							.43	1.37	1.70	2.04	1.04	6.01	1.97	2.50
28. Electricity		.72			8.33	.87	.87	.12	.34	.29		.40	.22	.23
29. Machinery		1.42	1.20		4.17	1.16	.87	.87	1.46	1.45	.76	4.25	1.45	1.62
30. Other causes	1.33	2.14	1.20		8.33	2.04	4.79	5.36	4.20	4.75	3.93	34.14	7.47	8.00
Total surface	**2.67**	**6.43**	**4.82**		**29.17**	**6.39**	**12.17**	**11.04**	**11.67**	**12.22**	**8.25**	**57.88**	**15.47**	**16.72**
Open pit:														
31. Falls or slides of rock or ore			4.82			1.16	1.74	.69	.31	.84	.85	3.67	.92	.77
32. Explosives	2.67				4.17	.87	1.31	.30	.01	.18		.36	.16	.14
33. Haulage system (cars, locomotives, etc.)	1.33		7.23			2.04	2.17	.07	.14	1.41		.61	.38	.79
34. Steam shovels			1.20			.29	1.74	.09	.06	1.47		.08	.33	.56
35. Falls of persons			1.20			.29		.18	.12	1.31	.21	1.17	.47	.78
36. Falls of derricks, booms, etc							.87			.06		.04	.02	.06
37. Run or fall of ore in or from ore bins							.43		.03	.08		.04	.03	.03
38. Machinery (other than locomotives or steam shovels)								.07	.04	.57	.16	.36	.20	.30
39. Electrictity					8.33	.58		.01	.03	.04		.04	.02	.02
40. Hand tools								.15	.37	1.47	.23	2.14	.66	.80
41. Other causes	2.67		3.62		4.17	1.75	.43	.47	.18	4.86	.59	6.89	1.85	3.02
Total open pit	6.67		18.07		16.67	6.98	8.70	2.03	1.29	12.29	2.04	15.40	5.04	7.27
Grand total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

TABLE 23.—*ALL MINES: Accidents during the year ended Decenber 31, 1922, by States and nature of injury.*

State.	Killed.	Temporary.			Permanent partial.[1]	Permanent total.[2]	**Total non-fatal.**	**Grand total.**
		1 to 14 days	More than 14 days.	Total.				
Alabama	17	556	400	956	19	1	**976**	**993**
Alaska	4	126	66	192	....	....	**192**	**196**
Arizona	23	2,325	873	3,198	37	....	**3,235**	**3,258**
California	64	870	523	1,393	4	....	**1,397**	**1,461**
Colorado	13	321	97	418	9	....	**427**	**440**
Florida	4	405	11	416	3	....	**419**	**423**
Georgia	....	....	....	....	....	....	....	....
Idaho	9	631	317	948	11	....	**959**	**968**
Illinois	3	29	18	47	2	....	**49**	**52**
Iowa	....	76	15	91	....	....	**91**	**91**
Kansas	1	509	120	629	11	1	**641**	**642**
Kentucky	1	66	7	73	5	....	**78**	**79**
Michigan	34	2,358	1,161	3,519	16	1	**3,536**	**3,570**
Minnesota	31	983	383	1,366	12	1	**1,379**	**1,410**
Missouri	11	807	178	985	2	1	**988**	**999**
Montana	32	2,006	482	2,488	9	....	**2,497**	**2,529**
Nevada	10	416	318	734	10	1	**745**	**755**
New Jersey	5	161	32	193	1	....	**194**	**199**
New Mexico	9	177	53	230	13	....	**243**	**252**
New York	17	840	163	1,003	6	....	**1,009**	**1,026**
North Carolina	....	14	....	14	....	....	**14**	**14**
Oklahoma	6	1,583	407	1,990	16	3	**2,009**	**2,015**
Oregon	....	31	5	36	....	....	**36**	**36**
Pennsylvania	1	9	11	20	1	....	**21**	**22**
South Dakota	5	492	110	602	....	....	**602**	**607**
Tennessee	3	308	69	377	1	....	**378**	**381**
Texas	3	346	47	393	6	....	**399**	**402**
Utah	27	2,068	464	2,532	32	....	**2,564**	**2,591**
Virginia	1	47	47	94	2	....	**96**	**97**
Washington	3	18	2	20	....	....	**20**	**23**
Wisconsin	3	64	60	124	1	....	**125**	**128**
Wyoming	1	17	7	24	....	....	**24**	**25**
Other States	3	671	64	735	2	....	**737**	**740**
Total	**344**	**19,330**	**6,510**	**25,840**	**231**	**9**	**26,080**	**26,424**

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[1] *Permanent partial disability.*—Loss of one foot, leg, hand, eye, one or more fingers, one or more toes, any dislocation where ligaments are severed, or any other injury known in surgery to be permanent partial disability.

[2] *Permanent total disability.*—Loss of both legs or arms, one leg and one arm, total loss of eyesight, paralysis, or other condition permanently incapacitating workman from doing any work of a gainful occupation.

TABLE 24.—*ALL MINES: Accidents during the year ended December 31, 1922, by causes and nature of injury.*

Cause.	Killed.	Temporary.			Permanent partial.	Permanent total.	**Total non-fatal.**	**Grand total.**
		1 to 14 days.	More than 14 days.	Total.				
Underground:								
Number killed or injured by—								
1. Fall of rock or ore from roof or wall	101	3,526	1,203	4,729	33	2	4,764	4,865
2. Rock or ore while loading at working face or chute.	3	2,274	686	2,960	16	....	2,976	2,979
3. Timber or hand tools	2	1,551	541	2,092	13	....	2,105	2,107
4. Explosives	27	192	115	307	17	3	327	354
5. Haulage (mine cars, mine locomotives, breaking of rope, etc.)	25	1,725	840	2,565	24	....	2,589	2,614
6. Persons falling down chute, winze, raise, or stope	32	387	255	642	6	....	648	680
7. Run of ore from chute or pocket	7	240	103	343	....	....	343	350
8. Drilling (by machine or hand drills)	4	1,180	309	1,489	14	1	1,504	1,508

TABLE 24.—*ALL MINES: Accidents during the year ended December 31, 192 by causes and nature of injury*—Continued.

Cause.	Killed.	Temporary.			Permanent partial.	Permanent total.	Total non-fatal.	Grand Total
		1 to 14 days.	More than 14 days.	Total.				
Underground—Continued.								
Number killed or injured by—Con.								
9. Electricity	2	113	21	134	....	....	134	136
10. Machinery (other than locomotives or drills)	2	160	74	234	5	....	239	241
11. Mine fires	47	5	1	6	....	....	6	53
12. Suffocation from natural gases	1	18	5	23	....	....	23	24
13. Inrush of water	....	....	....	....	....	....	....	....
14. Nails and splinters	....	471	100	571	4	....	575	575
15. Other causes	5	2,742	926	3,668	18	2	3,688	3,693
Total number killed or injured underground	**258**	**14,584**	**5,179**	**19,763**	**150**	**8**	**19,921**	**20,179**
Shaft:								
Number killed or injured by—								
16. Falling down shaft	12	26	22	48	5	....	53	65
17. Objects falling down shaft.	6	137	65	202	2	....	204	210
18. Breaking of cables	3	4	....	4	....	....	4	7
19. Overwinding	....	2	....	2	....	....	2	2
20. Cage, skip, or bucket	15	131	67	198	6	....	204	219
21. Other causes	4	258	86	344	....	....	344	348
Total number killed or injured by shaft accidents	**40**	**558**	**240**	**798**	**13**	....	**811**	**851**
Surface:								
Number killed or injured by—								
22. Mine cars or mine locomotives, gravity, or aerial trams	1	106	57	163	2	....	165	166
23. Railway cars and locomotives	4	137	39	176	1	....	177	181
24. Run or fall of ore in or from ore bins	....	62	13	75	....	....	75	75
25. Falls of persons	3	290	164	454	5	....	459	462
26. Nails and splinters	....	226	34	260	....	....	260	260
27. Hand tools, axes, bars, etc.	....	430	81	511	4	....	515	515
28. Electricity	3	49	7	56	1	....	57	60
29. Machinery	4	283	72	355	23	....	378	382
30. Other causes	7	1,608	327	1,935	13	....	1,948	1,955
Total number killed or injured by surface accidents	**22**	**3,191**	**794**	**3,985**	**49**	....	**4,034**	**4,056**
Open pit:								
Number killed or injured in pit by—								
31. Falls or slides of rock or ore	4	178	58	236	5	....	241	245
32. Explosives	3	21	21	42	1	....	43	46
33. Haulage (mine cars and locomotives and railway cars, etc.)	7	60	39	99	1	....	100	107
34. Steam shovels	1	62	21	83	1	1	85	86
35. Falls of persons	1	84	38	122	1	....	123	124
36. Falls of derricks, booms, etc	....	2	1	3	1	....	4	4
37. Run or fall of ore in or from ore bins	....	7	....	7	....	....	7	7
38. Machinery (other than locomotives or steam shovels)	....	35	13	48	4	....	52	52
39. Electricity	2	5	1	6	....	....	6	8
40. Hand tools	....	151	20	171	....	....	171	171
41. Other causes	6	392	85	477	5	....	482	488
Total number killed or injured by open-pit accidents	**24**	**997**	**297**	**1,294**	**19**	1	**1,314**	**1,338**
Grand total	**344**	**19,330**	**6,510**	**25,840**	**231**	**9**	**26,080**	**26,424**

ACCIDENT RATES BASED ON HOURS OF EXPOSURE.

The ratio of accident occurrence to the duration of exposure to risk constitutes the index to accident frequency and accident severity. Without this index it is impossible for the owner of a large mine to know definitely to what extent the hazards to which his employees are exposed are diminishing. Such an index is essential also to show the benefits derived from installing safeguards against accidents, so that one may know definitely whether the cost of installation was justified.

As a first step in establishing a correct basis for studying the frequency and severity of accidents to mine workers in the United States, the bureau, in its accident questionnaires for 1921 and 1922, requested operating companies to state the number of hours that constituted a working shift. Many companies furnished the information as requested, and for these companies it was possible to calculate the number of hours worked by all employees at their mines. Corresponding accident data were furnished for the same mines, so that it has been possible to calculate the accident-frequency rates based upon a uniform number of hours of exposure. The unit of exposure selected was one million hours.

Tables 25 and 26 show the number of employees and accidents underground in 1921 and 1922 classified according to length of shift. Accident-frequency rates are shown in Table 26 only for groups involving more than one million hours of work during the year. In connection with Table 26 it should be stated that the 8-hour men worked approximately 93 per cent of the total hours upon which the rates are based, the 9-hour men worked 2 per cent of the total, and the 10-hour men worked 5 per cent. The accident rates for the 8-hour men are representative of all methods of underground mining operations; the 9-hour rates mainly reflect the hazards of room-and-pillar work, underhand stoping, and caving, since most of the 9-hour men worked in mines where these methods were employed; nearly all of the 10-hour men worked in mines operated on the room-and-pillar system.

TABLE 25.—*ALL MINES (UNDERGROUND AND SHAFT ONLY)*:[1] *Labor and accident data, classified by length of shift, during the year ended December 31, 1922 and 1921.*

Length of shift.	Men employed.		Days of labor performed.	Total hours.	Average days per man.	Average hours per man.	Killed.	Nonfatal injuries.					Total fatal and nonfatal.
	Actual number.	Equivalent in 300-day workers.						Permanent disability.		Temporary disability.	Slight.	Total nonfatal.	
								Total.	Partial.				
1922.													
8 hours	46,777	44,573	13,371,795	106,974,360	286	2,287	180	7	118	3,976	11,366	15,467	15,647
9 hours	925	762	228,790	2,059,110	247	2,226	7			72	249	321	328
10 hours	2,884	2,247	674,129	6,741,290	234	2,337	8	1	17	182	477	677	685
11 hours													
12 hours													
All other and not stated	7,983	7,784	2,335,011		292		41		28	718	2,261	3,007	3,048
Total	**58,569**	**55,366**	**16,609,725**		**284**		**236**	**8**	**163**	**4,948**	**14,353**	**19,472**	**19,708**
1921.													
8 hours	34,721	27,209	8,162,841	65,302,728	235	1,881	121	5	74	2,541	6,829	9,449	9,570
9 hours	1,370	925	277,626	2,498,634	203	1,824	4		9	63	289	361	365
10 hours	1,342	784	235,235	2,352,350	175	1,753	1		8	45	148	201	202
11 hours													
12 hours													
All other and not stated	14,748	12,606	3,781,755		256		35		27	803	2,162	2,992	3,027
Total	**52,181**	**41,525**	**12,457,457**		**239**		**161**	**5**	**118**	**3,452**	**9,428**	**13,003**	**13,164**

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[1] Alaska, California, and all placer mines omitted.

TABLE 26.—*ALL MINES (UNDERGROUND AND SHAFT ONLY): Fatalities and injuries per 1,000,000 hours of exposure, classified by length of shift, during the year ended December 31, 1922 and 1921.*

Character of disability.	8 hours.	9 hours.	10 hours.
1922.			
Fatal	1.683	3.399	1.187
Permanent total disability	.065	....	.148
Permanent partial disability	1.103	....	2.522
Other serious	37.168	34.967	26.998
Slight	106.250	120.926	70.758
Total injuries	144.586	155.893	100.426
Total fatalities and injuries	146.269	159.292	101.613
1921.			
Fatal	1.853	1.601	.425
Permanent total disability	.077	....	....
Permanent partial disability	1.133	3.602	3.401
Other serious	38.911	25.214	19.130
Slight	104.574	115.663	62.916
Total injuries	144.695	144.479	85.447
Total fatalities and injuries	146.548	146.080	85.872

COMPARISON OF INJURY RATES AT LARGE AND SMALL MINES.

Table 27 affords a comparison of accident and labor data for large mines and small mines, classified according to the number of men employed underground. The figures include underground and shaft accidents only. . The combined fatality and injury rate for all mines included in the table was 354.86 per thousand 300-day workers in 1922 and 317.02 in 1921.

On the assumption that the figures for all mines employing 100 or more men in 1922 represent the real hazards of mining operations on a large scale, the table shows that the accident rates ranged from 355.78 fatalities and injuries per thousand 300-day workers to 384.39 per thousand, the former rate representing the group employing 200 to 299 men and the latter rate the group employing 300 or more men. In 1921 the rates ranged from 342.02 for mines employing 100 to 199 men to 388.80 for mines employing 300 or more men. In both years the lowest rates were for small mines employing less than 25 men, but it should be stated that the apparently low rate for this group was probably due as much to incomplete records of minor injuries as to less hazardous working conditions.

The table brings out forcibly the fact that most of the underground mining operations are conducted by a comparatively small number of mines. Out of a total of 1,672 mines employing 58,569 men and performing 16,609,725 days of labor, 401 mines employing 25 or more men each, employed an aggregate of 53,328 men or 91 per cent of the total, and worked 15,453,335 days of labor or 93 per cent of the total. Mines employing less than 25 men each numbered

1,271 and employed 5,241 men, or only 9 per cent of the total, and worked 1,156,390 shifts or 7 per cent of the total. The group of small mines averaged about 4 underground employees per mine; the group of larger mines averaged approximately 133 underground employees per mine.

TABLE 27.—*ACCIDENT RATES PER 1,000 300-DAY WORKERS, BASED ON SIZE OF OPERATIONS UNDERGROUND, for the year ended December 31, 1922 and 1921.*[1]

Men employed.	Number of plants.	Men employed.		Days of labor performed.	Average days active.	Killed.[2]	Injured.[2]	Killed per 1,000 300-day workers.	Injured per 1,000 300-day workers.	1921	
		Actual number.	Equivalent in 300-day workers.							Fatality rate.	Injury rate.
1-4	969	1,875	989	296,553	158	1	43	1.01	43.48	3.25	41.50
5-9	149	967	783	234,885	243	7	97	8.94	123.88	4.51	92.88
1-9	1,118	2,842	1,772	531,438	187	8	140	4.51	79.01	3.85	65.87
10-14	61	717	596	178,684	249	2	87	3.36	145.97	1.22	139.73
15-19	54	872	760	228,141	262	7	158	9.21	207.89	6.48	134.72
10-19	115	1,589	1,356	406,825	256	9	245	6.64	180.68	3.76	137.30
20-24	38	810	727	218,127	269	1	162	1.38	222.83	2.24	158.84
1-24	1,271	5,241	3,855	1,156,390	221	18	547	4.67	141.89	3.52	106.69
25-49	114	4,035	3,619	1,085,564	269	13	1,289	3.59	356.18	4.60	302.67
50-99	125	8,645	7,909	2,372,816	274	40	2,862	5.06	361.87	4.39	282.27
100-199	88	12,286	11,412	3,423,522	279	55	4,055	4.82	355.33	3.32	338.70
200-299	31	7,600	7,513	2,253,807	297	37	2,636	4.92	350.86	4.35	337.97
300 or more	43	20,762	21,059	6,317,626	304	71	8,024	3.37	381.02	3.81	384.99
	1,672	58,569	55,366	16,609,725	284	234	19,413	4.23	350.63	3.88	313.14

[1] Mines in Alaska and California not included.
[2] Includes accidents underground and in shafts.

ACCIDENTS CLASSIFIED BY MINING METHODS.

Different types of ore bodies require different systems of mining and the occupational hazards to which the miners are exposed differ with the system or methods in use. In order to show the accident hazards for the various methods, special tables have been compiled which are presented in this report. These special tables do not cover all metal mines in the United States, but only those for which the reports received were reasonably complete in all details. They cover 69 per cent of all underground employees and 73 per cent of all open-pit workers; they also cover 70 per cent of all shifts worked underground and 76 per cent of all shifts worked in open-pit mining. Men working in surface shops and yards are not included in these tables.

The figures for 1922 are based on reports from 276 companies employing 52,999 men underground or in open-pit mining. The total shifts worked by these employees was 15,053,659, an average of 284 workdays per man. Table 28 presents a summary of the accident and labor data for 1922 for nine different methods of mining.

Similar figures have been compiled since 1914 and the combined figures for nine years are given in Table 32. For the entire nine-year period the fatality rate of 4.65 per 1,000 full-time workers at mines working the room-and-pillar system is higher than for any other group. The nonfatal injury rate, 364.50, for the room-and-pillar system was, however, slightly exceeded by that for overhand stoping, which was 365.21. As is to be expected, the accident rates for open-pit mines are considerably below those for underground work. Among the various underground systems of mining the lowest fatality and injury rates were for mines using underhand stoping and those using caving systems.

Operators' reports, grouped by mining methods.

Method of mining.	Number of operators.							
	1915	1916	1917	1918	1919	1920	1921	1922
Room and pillar	52	62	57	92	91	63	55	75
Overhand stoping:								
(*a*) With stulls	17	22	20	20	28	20	18	14
(*b*) With square sets, cribs, etc.	31	32	31	39	47	32	28	24
(*c*) With filling	62	21	27	19	22	15	10	27
(*d*) Shrinkage	28	13	19	17	21	24	15	22
Underhand stoping	5	5	8	21	19	9	14	15
Caving methods	50	61	69	60	49	51	33	37
Open pit, with steam shovel	23	23	32	31	39	22	34	47
Open pit, without steam shovel	12	7	13	20	27	10	24	15
Total	280	246	276	319	343	246	231	276

TABLE 28.—*Summary of metal-mine accident data, grouped by methods of mining, during the year ended December 31, 1922.*

Method of mining	Number companies represented.	Number States represented.	Days active.	Total days labor.	Number men employed in mines.	Number 300-day workers.	Number killed.		Number injured.	
							Total.	Per 1,000 300-day workers.	Total.	Per 1,000 300-day workers.
Room and pillar	75	13	272	2,808,724	10,318	9,362	**35**	3.74	**4,216**	450.33
Overhand stoping:										
(*a*) **With stulls**	14	6	295	917,244	3,109	3,058	**8**	2.62	**1,449**	473.84
(*b*) **With square sets, cribs, etc**	24	7	305	2,813,240	9,232	9,378	**42**	4.48	**3,298**	351.67
(*c*) **With filling**	27	8	325	1,371,269	4,222	4,571	**21**	4.59	**1,678**	367.10
(*d*) **Shrinkage**	22	10	268	421,917	1,574	1,406	**18**	12.80	**297**	211.24
Underhand stoping	15	10	268	904,625	3,373	3,015	**14**	4.64	**734**	243.45
Caving methods	37	6	283	3,280,316	11,601	10,934	**43**	3.93	**3,424**	313.15
Open pit, with steam shovel	47	11	262	2,217,789	8,456	7,393	**16**	2.16	**800**	108.21
Open pit, without steam shovel	15	9	286	318,535	1,114	1,062	**2**	1.88	**186**	175.14
Total, 1922	**276**	....	**284**	**15,053,659**	**52,999**	**50,179**	**199**	**3.97**	**16,082**	**320.49**
Total, 1921	231	....	274	10,263,561	37,511	34,212	**126**	3.68	**9,925**	290.10
Total, 1920	246	....	309	19,057,185	61,742	63,524	**221**	3.48	**19,540**	307.60
Total, 1919	343	....	304	18,323,004	60,283	61,007	**253**	4.14	**18,130**	296.84
Total, 1918	319	....	307	22,838,062	74,510	76,127	**349**	4.58	**24,582**	322.91
Total, 1917	275	....	304	24,808,172	81,611	82,694	**328**	3.97	**26,340**	318.52
Total, 1916	246	....	307	21,496,327	69,997	71,653	**291**	4.06	**28,576**	398.82
Total, 1915	280	....	303	22,842,999	75,365	76,140	**324**	4.25	**27,314**	358.73
Total, 1914	258	....	292	22,004,824	75,453	73,349	**361**	4.92	**24,306**	331.38

TABLE 29.—*FATALITIES, classified by principal causes and mining methods, during the years ended December 31, 1922 and 1921.*

Method of mining.	Number killed.																							
	By falls of rock.			By run or fall of ore while loading at chute, bin, or working face.			By explosives.			By haulage.			By falls of persons.			Miscellaneous.			In shaft.			Total.	
	1 and 31.			**2, 7, and 37.**			**4 and 32.**			**5 and 33.**			**6 and 35.**			**3, 8, 9, 10, 11, 12, 13, 14, 15, 34, 36, 38, 39, 40, and 41.**			**16, 17, 18, 19, 20, and 21.**				
	Number.	Per cent of total.	Rate per 1,000 300-day workers.	Number.	Per cent of total.	Rate per 1,000 300-day workers.	Number.	Per cent of total.	Rate per 1,000 300-day workers.	Number.	Per cent of total.	Rate per 1,000 300-day workers.	Number.	Per cent of total.	Rate per 1,000 300-day workers.	Number.	Per cent of total.	Rate per 1,000 300-day workers.	Number.	Per cent of total.	Rate per 1,000 300-day workers.	**Number.**	**Rate per 1,000 300-day workers.**
1922.																							
Room and pillar	14	40.00	1.50	...	...	...	7	20.00	0.75	6	17.14	0.64	...	...	...	2	5.72	0.21	6	17.14	0.64	**35**	**3.74**
Overhand stoping:																							
(*a*) With stulls	...	...	...	...	...	...	1	12.50	.33	2	25.00	.65	1	12.50	0.33	1	12.50	.33	3	37.50	.98	**8**	**2.62**
(*b*) With square sets, cribs, etc.	21	50.00	2.24	1	2.38	.11	5	11.91	.53	5	11.91	.53	3	7.14	.32	2	4.76	.21	5	11.91	.53	**42**	**4.48**
(*c*) With filling	10	47.61	2.19	...	...	...	...	...	...	1	4.76	.21	6	28.57	1.31	2	9.53	.44	2	9.53	.44	**21**	**4.59**
(*d*) Shrinkage	7	38.88	4.98	...	...	...	1	5.56	.71	1	5.56	.71	7	38.88	4.98	1	5.56	.71	1	5.56	.71	**18**	**12.80**
Underhand stoping	7	50.00	2.32	...	...	...	3	21.43	1.00	1	7.14	.33	1	7.14	.33	1	7.14	.33	1	7.14	.33	**14**	**4.64**
Caving methods	20	46.51	1.83	3	6.98	.27	...	...	...	5	11.63	.46	5	11.63	.46	3	6.98	.27	7	16.27	.64	**43**	**3.93**
Open pit, with steam shovel	4	25.00	.54	...	...	...	1	6.25	.13	7	43.75	.95	1	6.25	.13	3	18.75	.40	...	...	...	**16**	**2.16**
Open pit, without steam shovel	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	100.00	1.88	...	...	...	**2**	**1.88**
Total, 1922	**83**	**41.71**	**1.65**	**4**	**2.01**	**.08**	**18**	**9.05**	**.36**	**28**	**14.07**	**.56**	**24**	**12.06**	**.48**	**17**	**8.54**	**.34**	**25**	**12.56**	**.50**	**199**	**3.97**
1921.																							
Room and pillar	13	65.00	2.36	...	...	...	...	...	...	1	5.00	.18	1	5.00	.18	3	15.00	.54	2	10.00	.36	**20**	**3.62**
Overhand stoping:																							
(*a*) **With stulls**	5	50.00	1.73	...	...	...	2	20.00	.69	1	10.00	.35	...	...	...	...	...	...	2	20.00	.69	**10**	**3.46**
(*b*) **With square sets, cribs, etc.**	5	31.25	.89	1	6.25	.18	3	18.75	.54	1	6.25	.18	1	6.25	.18	3	18.75	.54	2	12.50	.36	**16**	**2.87**
(*c*) **With filling**	6	46.15	3.03	...	...	...	2	15.39	1.01	2	15.39	1.01	...	...	...	...	...	...	3	23.07	1.51	**13**	**6.56**
(*d*) **Shrinkage**	5	35.71	3.07	...	...	...	2	14.29	1.23	...	...	...	3	21.43	1.84	1	7.14	.62	3	21.43	1.84	**14**	**8.60**

Underhand stoping	4	30.77	1.63	......	......	......	......	......	......	3	23.08	1.22	2	15.38	.82	......	......	......	4	30.77	1.63	13	5.30
Caving methods	8	36.36	1.03	2	9.09	.26	3	13.63	.39	1	4.55	.13	1	4.55	.13	2	9.09	.26	5	22.73	.64	22	2.84
Open pit, with steam shovel	......	......	......	1	7.14	.18	1	7.14	.18	5	35.72	.93	......	......	......	7	50.00	1.30	......	......	......	14	2.59
Open pit, without steam shovel	3	75.00	3.04	......	......	......	1	25.00	1.01	......	......	......	......	......	......	......	......	......	......	......	......	4	4.05
Total, 1921	**49**	**38.89**	**1.43**	**4**	**3.17**	**.12**	**14**	**11.11**	**.41**	**14**	**11.11**	**.41**	**8**	**6.35**	**.23**	**18**	**12.70**	**.47**	**21**	**16.67**	**.61**	**126**	**3.68**

TABLE 30.—***INJURIES**, classified by principal causes and mining methods, during the years ended December 31, 1922 and 1921.*

Method of mining.	Number injured.																						
	By falls of rock.			By run or fall of ore while loading at chute, bin, or working face.			By explosives.			By haulage.			By falls of persons.			Miscellaneous.			In shaft.			Total.	
	1 and 31.[1]			**2, 7, and 37.**			**4 and 32.**			**5 and 33.**			**6 and 35.**			**3, 8, 9, 10, 11, 12, 13, 14, 15, 34, 36, 38, 39, 40, and 41.**			**16, 17, 18, 19, 20, and 21.**				
	Number.	Per cent of total.	Rate per 1,000 300-day workers.	Number.	Per cent of total.	Rate per 1,000 300-day workers.	Number.	Per cent of total.	Rate per 1,000 300-day workers.	Number.	Per cent of total.	Rate per 1,000 300-day workers.	Number.	Per cent of total.	Rate per 1,000 300-day workers.	Number.	Per cent of total.	Rate per 1,000 300-day workers.	Number.	Per cent of total.	Rate per 1,000 300-day workers.	**Number.**	Rate per 1,000 300-day workers.
1922.																							
Room and pillar	603	14.30	64.41	1,153	27.35	123.16	68	1.61	7.26	741	17.58	79.15	72	1.71	7.69	1,359	32.23	145.16	220	5.22	23.50	**4,216**	450.33
Overhand stoping:																							
(*a*) With stulls	326	22.50	106.61	178	12.28	58.21	30	2.07	9.81	163	12.25	53.30	82	5.66	26.81	555	38.30	181.49	115	7.94	37.61	**1,449**	473.84
(*b*) With square sets, cribs, etc.	767	23.26	81.79	447	13.55	47.66	25	.76	2.67	486	14.74	51.82	123	3.73	13.12	1,356	41.11	144.59	94	2.85	10.02	**3,298**	351.67
(*c*) With filling	606	36.11	132.58	169	10.07	36.97	37	2.21	8.10	129	2.69	28.22	35	2.09	7.66	656	39.09	143.51	46	2.74	10.06	**1,678**	367.10
(*d*) Shrinkage	36	12.12	25.60	80	26.94	56.90	5	1.68	3.56	29	9.76	20.63	14	4.71	9.96	116	39.06	82.50	17	5.73	12.09	**297**	211.24
Underhand stoping	98	13.35	32.50	188	25.61	62.35	15	2.04	4.98	157	21.39	52.07	23	3.13	7.63	249	33.93	82.59	4	.55	1.33	**734**	243.45
Caving methods	784	22.90	71.70	453	13.23	41.43	68	1.98	6.22	419	12.24	38.32	88	2.57	8.05	1,507	44.01	137.83	105	3.07	9.60	**3,424**	313.15
Open pit with steam shovel	88	11.00	11.90	6	.75	.81	12	1.50	1.62	85	10.63	11.50	79	9.87	10.69	530	66.25	71.69	....	......	......	**800**	108.21
Open pit without steam shovel	20	10.75	18.83	......	......	......	5	2.69	4.71	......	......	......	14	7.53	13.18	147	79.03	138.42	....	......	......	**186**	175.14
Total, 1922	**3,328**	**20.69**	**66.32**	**2,674**	**16.63**	**53.29**	**265**	**1.65**	**5.28**	**2,209**	**13.74**	**44.02**	**530**	**3.29**	**10.56**	**6,475**	**40.26**	**129.04**	**601**	**3.74**	**11.98**	**16,082**	**320.49**

1921.																				
Room and pillar	238	11.89	43.06	542	27.09	98.07	66	3.30	11.94	381	19.04	68.93	33	1.65	5.97	681	34.03	123.21	60	3.00	10.86	2,001	362.04
Overhand stoping:																							
(*a*) With stulls	176	18.62	60.79	143	15.13	49.40	5	.53	1.73	130	13.76	44.91	57	6.03	19.69	400	42.33	138.17	34	3.60	11.74	945	326.43
(*b*) With square sets, cribs, etc.	384	24.69	68.82	159	10.23	28.49	9	.58	1.61	193	12.41	34.59	43	2.77	7.71	720	46.30	129.03	47	3.02	8.42	1,555	278.67
(*c*) With filling	137	15.51	69.12	270	30.58	136.23	6	.68	3.03	95	10.76	47.93	14	1.58	7.06	319	36.13	160.95	42	4.76	21.19	883	445.51
(*d*) Shrinkage	76	14.45	46.71	154	29.28	94.65	11	2.09	6.76	62	11.79	38.11	17	3.23	10.45	191	36.31	117.39	15	2.85	9.22	526	323.29
Underhand stoping	84	11.76	34.22	211	29.55	85.95	4	.56	1.63	116	16.25	47.25	19	2.66	7.74	271	37.96	110.39	9	1.26	3.66	714	290.84
Caving methods	607	26.21	78.27	303	13.08	39.07	41	1.77	5.29	310	13.39	39.98	112	4.83	14.44	896	38.69	115.54	47	2.03	6.06	2,316	298.65
Open pit, with steam shovel	65	8.46	12.03	4	.52	.74	7	.91	1.30	110	14.32	20.36	84	10.94	15.54	498	64.85	92.15	....	......	......	768	142.12
Open pit, without steam shovel	27	12.44	27.35	......	......	......	6	2.77	6.08	14	6.45	14.19	14	6.45	14.19	156	71.89	158.05	....	......	......	217	219.86
Total, 1921	**1,794**	**18.06**	**52.44**	**1,788**	**17.99**	**52.20**	**155**	**1.56**	**4.53**	**1,411**	**14.22**	**41.24**	**393**	**3.96**	**11.49**	**4,132**	**41.63**	**120.78**	**254**	**2.56**	**7.42**	**9,925**	**290.10**

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[1] Numbers refer to causes as shown in Table 31 and other similar tables.

TABLE 31.—*Metal-mine accidents in 1922,*

NUMBER KILLED.

Method.	Underground.									
	Fall of rock or ore from roof or wall.	Rock or ore while loading at working face.	Timber or hand tools.	Explosives.	Haulage accidents.	Falling down chute, winze, raise, or stope.	Run of ore from chute or pocket.	Drilling accidents.	Electricity.	Machinery (not including locomotives or drills).
	1	2	3	4	5	6	7	8	9	10
Room and pillar	14	......	......	7	6	......	......	2	......	......
Overhand stoping:										
(*a*) With stulls	......	......	......	1	2	1	......	......	......	......
(*b*) With square sets, cribs, etc	21	1	......	5	5	3	......	......	......	......
(*c*) With filling	10	......	1	......	1	6	......	1	......	......
(*d*) Shrinkage	7	......	......	1	1	7	......	......	1	......
Underhand stoping	7	......	1	3	1	1	......	......	......	......
Caving methods	20	1	......	......	5	5	2	1	1	1
Open pit with steam shovel	......	......	......	......	......	......	......	......	......	......
Open pit without steam shovel	......	......	......	......	......	......	......	......	......	......
Total, 1922	79	2	2	17	21	23	2	4	2	1
Total, 1921	46	2	2	12	7	10	1	......	1	......

NUMBER INJURED.

Method.	1	2	3	4	5	6	7	8	9	10
Room and pillar	603	1,139	140	68	741	72	14	321	33	63
Overhand stoping:										
(*a*) With stulls	326	152	98	30	163	82	26	142	17	10
(*b*) With square sets, cribs, etc.	767	427	548	25	486	123	20	133	10	28
(*c*) With filling	606	143	173	37	129	35	26	135	7	3
(*d*) Shrinkage	36	70	16	5	29	14	10	49	3	5
Underhand stoping	98	185	65	15	157	23	3	56	11	4
Caving methods	784	293	614	68	419	88	160	176	10	36
Open pit with steam shovel	......	......	......	......	......	......	......	......	......	......
Open pit without steam shovel.	......	......	......	......	......	......	......	......	......	......
Total, 1922	**3,220**	**2,409**	**1,654**	**248**	**2,124**	**437**	**259**	**1,012**	**91**	**149**
Total, 1921	1,702	1,638	991	142	1,287	295	144	624	48	93

by causes, grouped by mining methods.

NUMBER KILLED.

Underground.						Shaft.						
Mine fires.	Suffocation from **natural gases.**	Inrush of water.	Stepping on nail.	Other causes.	**Total, underground.**	Falling down shafts.	Objects falling down shafts.	**Breaking of cables.**	Overwinding.	**Skip or cage.**	Other causes.	**Total, shaft.**
11	12	13	14	15		16	17	18	19	20	21	
......	......	......	......	......	**29**	4	......	......	......	2	......	**6**
......	......	......	......	1	**5**	......	......	......	......	2	1	**3**
......	......	......	......	2	**37**	......	......	......	......	4	1	**5**
......	......	......	......	......	**19**	1	1	......	......	......	......	**2**
......	......	......	......	......	**17**	......	1	......	......	......	......	**1**
......	......	......	......	......	**13**	1	......	......	......	......	......	**1**
......	......	......	......	......	**36**	1	......	3	......	2	1	**7**
......	......	......	......	......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	......	......	......	......	......	......
......	......	......	......	3	**156**	7	2	3	......	10	3	**25**
......	......	......	......	6	**87**	12	1	......	......	8	......	**21**

NUMBER INJURED.

......	2	......	45	755	**3,996**	10	50	......	1	42	117	**220**
......	1	......	39	248	**1,334**	6	25	1	......	30	53	**115**
2	1	......	95	539	**3,204**	7	26	1	......	29	31	**94**
......	......	......	38	300	**1,632**	1	22	......	......	16	7	**46**
......	......	......	10	33	**280**	2	7	......	......	6	2	**17**
......	3	......	9	101	**730**	......	1	......	......	1	2	**4**
1	6	......	117	547	**3,319**	12	22	1	......	10	60	**105**
......	......	......	......	......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	......	......	......	......	......	......
3	13	......	353	**2,523**	**14,495**	38	153	3	1	134	**272**	**601**
......	18	......	194	1,510	**8,686**	31	74	......	1	82	66	**254**

TABLE 31.—*Metal-mine accidents in 1922, by*

NUMBER KILLED.

Method.	Surface.									
	Mine cars, mine locomotives, or aerial trams.	Railway cars and locomotives.	Run or fall of ore in or from ore bins.	Falls of persons.	Stepping on nail.	Hand tools, axes, bars, etc.	Electricity.	Machinery.	Other causes.	**Total, surface.**
	22	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	
Room and pillar										
Overhand stoping:										
(*a*) With stulls										
(*b*) With square sets, cribs, etc										
(*c*) With filling										
(*d*) Shrinkage										
Underhand stoping										
Caving methods										
Open pit with steam shovel										
Open pit without steam shovel										
Total, 1922										
Total, 1921										

NUMBER INJURED.

Method.	Mine cars, mine locomotives, or aerial trams.	Railway cars and locomotives.	Run or fall of ore in or from ore bins.	Falls of persons.	Stepping on nail.	Hand tools, axes, bars, etc.	Electricity.	Machinery.	Other causes.	Total, surface.
Room and pillar										
Overhand stoping:										
(*a*) With stulls										
(*b*) With square sets, cribs, etc										
(*c*) With filling										
(*d*) Shrinkage										
Underhand stoping										
Caving methods										
Open pit with steam shovel										
Open pit without steam shovel										
Total, 1922										
Total, 1921										

causes, grouped by mining methods—Continued.

NUMBER KILLED.

Open pit.												
Falls or slides of rock or ore.	Explosives.	Haulage accidents (locomotives, etc.).	Steam shovels.	Falls of persons.	Falls of derricks, booms, etc.	Run or fall of ore in or from ore bins.	Machinery (other than locomotives or steam shovels).	Electricity.	Hand tools.	Other causes.	**Total, open pit.**	Grand total.
31	32	33	34	35	36	37	38	39	40	41		
......	......	......	......	......	......	......	......	......	......	......	......	35
......	......	......	......	......	......	......	......	......	......	......	......	8
......	......	......	......	......	......	......	......	......	......	......	......	42
......	......	......	......	......	......	......	......	......	......	......	......	21
......	......	......	......	......	......	......	......	......	......	......	......	18
......	......	......	......	......	......	......	......	......	......	......	......	14
......	......	......	......	......	......	......	......	......	......	......	......	43
4	1	7	1	1	......	......	......	......	......	2	16	16
......	......	......	......	......	......	......	......	1	......	1	2	2
4	**1**	**7**	**1**	**1**	......	......	......	**1**	......	**3**	**18**	**199**
3	2	5	4	......	2	1	......	......	......	1	18	126

NUMBER INJURED.

......	......	......	......	......	......	......	......	......	......	......	......	4,216
......	......	......	......	......	......	......	......	......	......	......	......	1,449
......	......	......	......	......	......	......	......	......	......	......	......	3,298
......	......	......	......	......	......	......	......	......	......	......	......	1,678
......	......	......	......	......	......	......	......	......	......	......	......	297
......	......	......	......	......	......	......	......	......	......	......	......	734
......	......	......	......	......	......	......	......	......	......	......	......	3,424
88	12	85	75	79	3	6	31	5	106	310	800	800
20	5	......	......	14	......	......	5	1	37	104	186	186
108	**17**	**85**	**75**	**93**	**3**	**6**	**36**	**6**	**143**	**414**	**986**	**16,082**
92	13	124	77	98	8	4	40	1	108	420	985	9,925

TABLE 32.—*Accidents compared by mining methods and causes for the* **nine-year** *period, 1914 to 1922, inclusive.*

	Room and pillar.		Overhand stoping.		Underhand stoping.		Caving methods.		Open pit.			
									Steam shovel.		Without steam shovel.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Nonfatal injuries:												
Fall of rock (roof or bank)	4,001	13.87	22,121	24.74	895	9.03	14,579	29.15	2,442	16.05	284	20.64
Run or fall of rock or ore while loading	7,228	25.05	15,836	17.71	2,833	28.58	5,749	11.50	51	.33	7	.51
Explosives	492	1.71	995	1.11	338	3.41	864	1.73	389	2.56	55	4.00
Haulage	5,660	19.61	11,191	12.51	2,138	21.57	6,354	12.71	1,845	12.13	153	11.12
Falls of persons	480	1.66	2,958	3.31	227	2.29	1,227	2.45	1,285	8.45	95	6.90
Miscellaneous	9,655	33.46	33,840	37.84	3,372	34.01	19,897	39.79	9,201	60.48	782	56.83
Shaft	1,340	4.64	2,489	2.78	110	1.11	1,337	2.67	....	....	....	....
Total nonfatal injuries	**28,856**	**100.00**	**89,430**	**100.00**	**9,913**	**100.00**	**50,007**	**100.00**	**15,213**	**100.00**	**1,376**	**100.00**
Fatalities:												
Fall of rock (roof or bank)	170	46.20	456	41.01	49	37.69	281	45.77	42	20.59	14	56.00
Run or fall of rock or ore while loading	6	1.63	40	3.60	6	4.62	27	4.40	1	.49	....	....
Explosives	58	15.76	99	8.90	17	13.08	53	8.63	38	18.63	4	16.00
Haulage	48	13.05	60	5.40	22	16.92	54	8.79	81	39.70	2	8.00
Falls of persons	8	2.17	106	9.53	6	4.62	42	6.84	5	2.45	2	8.00
Miscellaneous	19	5.16	119	10.70	7	5.38	61	9.93	37	18.14	3	12.00
Shaft	59	16.03	232	20.86	23	17.69	96	15.64	....	....	....	....
Total fatalities	**368**	**100.00**	**1,112**	**100.00**	**130**	**100.00**	**614**	**100.00**	**204**	**100.00**	**25**	**100.00**
Number of 300-day workers	79,165		244,874		29,979		150,738		76,052		10,147	
Nonfatal accident rate per 1,000 300-day workers	364.50		365.21		330.66		331.75		200.03		135.61	
Fatality rate per 1,000 300-day workers	4.65		4.54		4.34		4.07		2.68		2.46	

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ROOM-AND-PILLAR SYSTEM.

The room-and-pillar system of mining is peculiarly adapted to ore deposits that lie flat or nearly flat. The accident data for mines using this system in 1922 are based upon the reports of 75 companies employing 10,318 men underground; the employees worked 2,808,724 shifts, an average of 272 workdays per man. Accidents resulted in 35 deaths and 4,216 nonfatal injuries among the workmen, representing a fatality rate of 3.74 per 1,000 employees (300-day basis) and an injury rate of 450.33, as compared with a fatality rate of 3.62 and an injury rate of 362.04 in 1921. The main cause of the nonfatal accidents was the falling or running of ore while loading at chute, bin, or working face, and was responsible for 27 per cent of the injuries. Next in order were haulage accidents, which were responsible for 18 per cent of the injuries, followed by falls of rock from roof or wall, which caused 14 per cent of the injuries.

The injury rate of 450.33 per 1,000 employees for the room-and-pillar method was higher in 1922 than the rate for any other mining method except overhand stoping with stulls, for which the rate was 473.84. During the nine-year period 1914 to 1922 the average fatality rate for the room-and-pillar system was 4.65 per 1,000 employees and the average nonfatal injury rate was 364.50.

Number killed and injured in mines using ***room-and-pillar*** *method of mining during the calendar years 1915 to 1922.*

Cause.	Killed.								Injured.							
	1915	1916	1917	1918	1919	1920	1921	1922	1915	1916	1917	1918	1919	1920	1921	1922
Fall of rock......	17	21	33	10	23	17	13	14	401	591	402	430	547	324	238	603
Run or fall of rock or ore in loading..........	....	....	1	....	....	4	....	....	746	998	734	749	707	873	542	1,153
Explosives........	7	9	7	8	9	3	....	7	45	58	31	43	43	68	66	68
Haulage...........	....	7	6	2	6	12	1	6	429	793	707	544	696	651	381	741
Falls of persons..	1	2	2	....	....	....	1	....	29	68	88	50	43	43	33	72
Miscellaneous....	....	2	2	....	3	3	3	2	1,045	1,273	858	1,124	1,084	1,174	681	1,359
Shaft.............	2	6	10	18	6	6	2	6	124	232	133	211	134	145	60	220
Total.......	27	47	61	38	47	45	20	35	2,819	4,013	2,953	3,151	3,254	3,278	2,001	4,216
Per 1,000 300-day workers.........	3.97	5.59	6.00	4.11	4.38	4.26	3.62	3.74	413.95	477.17	290.68	341.20	303.26	310.50	362.04	450.33

OVERHAND STOPING.

Accident reports for mines using overhand stoping methods were received from 87 companies employing 18,137 men underground. These men averaged 305 workdays during 1922. Eighty-nine fatalities and 6,722 injuries among the underground workers resulted in a fatality rate of 4.83 per 1,000 men employed (300-day basis) and an injury rate of 365.07, as compared with rates of 4.39 killed and 323.49 injured in 1921. The combined fatality rate for overhand stoping was higher than that for any other method; the nonfatal injury rate was exceeded by that for the room-and-pillar method, which was 450.33.

Of the different types of overhand stoping, shrinkage showed the highest fatality rate, 12.80 per 1,000 employees, followed by a rate of 4.59 for mines where filling methods are used. The highest injury rate was 473.84 per 1,000 employees, for mines using overhand stoping with stulls. At mines where stulls were used, at mines using square sets, cribs, etc., and at mines using filling methods fall of rock or ore from roof or wall was the principal cause of nonfatal injuries. At mines using shrinkage methods, the largest single cause of accidents was the falling or running of the ore while the men were loading it at chutes, bins, or working face. The average fatality rate for overhand stoping during the nine years 1914 to 1922 was 4.54 per 1,000 300-day workers and the injury rate was 365.21.

*Number killed and injured in mines where **overhand stoping** was principal method used during the calendar years 1915 to 1922.*

Cause.	Killed.								Injured.							
	1915	1916	1917	1918	1919	1920	1921	1922	1915	1916	1917	1918	1919	1920	1921	1922
Fall of rock	89	51	48	51	40	41	21	38	3,579	3,431	3,370	2,784	1,704	1,685	773	1,735
Run or fall of rock or ore in loading	10	5	5	9	4	2	1	1	2,922	2,717	2,325	1,630	994	1,128	726	874
Explosives	16	10	15	12	5	8	9	7	134	204	161	91	75	77	31	97
Haulage	9	6	4	6	8	6	4	9	1,771	1,604	1,798	1,443	832	912	480	807
Falls of persons	21	5	12	6	9	7	4	17	519	354	347	376	167	254	131	254
Miscellaneous	13	16	17	33	11	11	4	6	6,391	4,525	4,688	4,051	2,568	3,027	1,630	2,683
Shaft	35	32	33	31	21	16	10	11	352	363	377	285	223	189	138	272
Total	193	125	134	148	98	91	53	89	15,668	13,198	13,066	10,660	6,563	7,272	3,909	6,722
Per 1,000 300-day workers	4.71	4.13	3.67	5.00	4.71	4.36	4.39	4.83	382.72	436.44	358.23	360.27	315.30	348.34	323.49	365.07

UNDERHAND STOPING.

The figures for the underhand stoping system of mining are compiled from the reports of 15 companies operating mines in 10 States and employing 3,373 men underground for an average of 268 days per man. Accidents killed 14 men and injured 734, making the fatality rate 4.64 per 1,000 employees and the injury rate 243.45, as compared with a fatality rate of 5.30 and an injury rate of 290.84 in the preceding year. The fatality rate in 1922 was higher than that for any other system of mining except that for the shrinkage method of overhand stoping. The injury rate was lower than for other methods of underground operations except overhand stoping with shrinkage. The main cause of accidents in underhand stoping work was run or fall of ore while loading it at the face, chute, or bin; next in order came accidents due to haulage. The nine-year fatality rate for underhand stoping from 1914 to 1922 was 4.34 per 1,000 full-time workers, and the corresponding injury rate was 330.66.

Number killed and injured in mines where ***underhand stoping*** *was principal method used during the calendar years 1915 to 1922.*

Cause.	Killed.								Injured.							
	1915	1916	1917	1918	1919	1920	1921	1922	1915	1916	1917	1918	1919	1920	1921	1922
Fall of rock......	7	3	13	6	7	2	4	7	53	95	77	170	197	121	84	98
Run or fall of rock or ore in loading.	1	1	....	....	4	....	....	....	248	524	402	394	338	528	211	188
Explosives.......	1	3	1	3	2	4	....	3	17	217	9	33	36	7	4	15
Haulage..........	1	2	3	3	6	3	3	1	329	365	395	221	282	273	116	157
Falls of persons..	....	1	....	....	....	2	2	1	6	24	21	28	74	32	19	23
Miscellaneous....	....	1	....	4	....	1	....	1	312	459	475	551	634	421	271	249
Shaft............	1	1	2	10	3	1	4	1	11	23	1	44	8	10	9	4
Total......	11	12	19	26	22	13	13	14	976	1,707	1,360	1,441	1,569	1,392	714	734
Per 1,000 300-day workers........	5.72	3.23	4.10	4.94	4.33	3.34	5.30	4.64	507.80	460.11	297.99	273.53	308.74	357.38	290.84	243.45

CAVING SYSTEMS.

The figures presented in the following table represent several varieties of the caving system, such as top slicing, substoping, block caving, etc., and the preliminary work that is necessary for any caving system. Accident reports were received from 37 companies operating in six States at whose mines 11,601 men were employed underground, each man averaging 283 workdays during 1922. Accidents resulted in 43 fatalities and 3,424 injuries, indicating a death rate of 3.93 and an injury rate of 313.15 per 1,000 employees (300-day workers), as compared with a fatality rate of 2.84 and an injury rate of 298.65 in 1921. In 1922 the fatality rate for caving methods was next to the lowest rate for underground systems of mining, the lowest rate being that for the room-and-pillar method. The injury rate was not as low as that for underhand stoping and overhand stoping with shrinkage. Falls or slides of rock from roof or wall were the chief cause of accidents at mines using caving methods. The average fatality rate for this system of mining over a nine-year period (1914–1922) was 4.07 and the average injury rate for the same period was 331.75.

Number killed and injured in mines using the caving system of mining during the calendar years 1915 to 1922.

Cause.	Killed.								Injured.							
	1915	1916	1917	1918	1919	1920	1921	1922	1915	1916	1917	1918	1919	1920	1921	1922
Fall of rock......	34	34	36	38	40	29	8	20	1,879	1,962	1,841	1,915	1,777	1,769	607	784
Run or fall of rock or ore in loading.	4	3	3	2	3	5	2	3	486	889	745	936	600	739	303	453
Explosives........	8	13	6	7	5	4	3	....	66	173	100	138	86	113	41	68
Haulage..........	2	8	13	6	6	4	1	5	794	978	840	798	657	777	310	419
Falls of persons..	8	7	8	4	3	....	1	5	142	124	146	194	139	139	112	88
Miscellaneous....	7	2	3	22	2	8	2	3	2,267	2,795	2,711	2,658	2,157	2,456	896	1,507
Shaft............	4	13	16	13	8	5	5	7	167	213	162	174	124	145	47	105
Total......	67	80	85	92	67	55	22	43	5,801	7,134	6,545	6,813	5,540	6,138	2,316	3,424
Per 1,000 300-day workers........	3.79	3.92	4.28	4.69	3.88	3.02	2.84	3.93	328.13	349.71	329.84	347.55	320.51	337.57	298.65	313.15

OPEN-PIT MINING WITH STEAM SHOVEL.

Open-pit mining with steam shovel is represented by reports from 47 companies operating mines in 11 States and employing 8,456 men (shop employees excluded), each of whom averaged 262 workdays in 1922. Accidents killed 16 men and injured 800. The fatality rate was 2.16 per 1,000 employees, as compared with 2.59 in 1921, and the injury rate was 108.21, as compared with 142.12. The fatality rate was lower than that for any other method except open-pit mining without steam shovels; the injury rate was lower than that for any other method of mining. Most of the accidents for this group of mines in 1922 were due to falls or slides of rock and to haulage. During the nine years 1914 to 1922 the average fatality rate was 2.68 and the average injury rate was 200.03.

Number killed and injured in ***open-pit*** *mines where the ore was mined by steam shovel during the calendar years 1915 to 1922.*

Cause.	Killed.								Injured.							
	1915	1916	1917	1918	1919	1920	1921	1922	1915	1916	1917	1918	1919	1920	1921	1922
Fall of rock.......	4	5	9	11	4	....	....	4	449	402	380	346	144	143	65	88
Run or fall of rock or ore in loading.	....	....	....	....	....	....	1	....	8	9	17	5	2	......	4	6
Explosives.......	1	7	4	9	1	6	1	1	38	41	75	57	25	27	7	12
Haulage..........	16	11	13	13	5	3	5	7	194	287	304	336	130	128	110	85
Falls of persons..	....	....	....	1	2	1	....	1	179	129	223	189	71	93	84	79
Miscellaneous....	3	4	3	5	3	6	7	3	1,040	1,548	1,288	1,352	704	985	498	530
Shaft............	....	....	....	....	....	....	....	....	......	......	......	......	......	......	......	......
Total......	24	27	29	39	15	16	14	16	1,908	2,416	2,287	2,285	1,076	1,376	768	800
Per 1,000 300-day workers........	3.16	3.15	2.81	3.66	2.48	1.73	2.59	2.16	250.79	281.58	221.39	214.27	178.00	149.13	142.12	108.21

OPEN-PIT MINING WITHOUT STEAM SHOVEL.

Reports from open-pit mines where steam shovels were not used were received from 15 companies in nine States employing 1,114 men. Each man averaged 286 workdays in 1922. Accidents killed 2 men and injured 186, the fatality rate being 1.88 and the injury rate being 175.14, as compared with rates of 4.05 killed and 219.86 injured in 1921. The total period of exposure to mining hazards for this group of workers in 1922 was equivalent to only 318,535 man-days, too small a period to lend much significance to the fluctuating rates from year to year. The average fatality rate was 2.46 during the nine-year period 1914 to 1922, and the average nonfatal injury rate was 135.61. Both of these rates are lower than the rates for any other method of mining during the same nine-year period. Most of the accidents in 1922 at this group of mines were due to falls or slides of rock or overburden.

Number killed and injured in **open-pit** *mines where no steam shovels were used during the calendar years 1915 to 1922.*

Cause.	Killed.								Injured.							
	1915	1916	1917	1918	1919	1920	1921	1922	1915	1916	1917	1918	1919	1920	1921	1922
Fall of rock	1	....	....	2	3	1	3	....	16	26	24	81	13	18	27	20
Run or fall of rock or ore in loading	....	....	....	....	....	....	....	....	1	3	.....	.....	.....	.....	.....	.....
Explosives	....	....	....	2	1	....	1	....	1	5	16	7	7	3	6	5
Haulage	....	....	....	1	....	....	....	....	22	34	21	22	5	7	14	.....
Falls of persons	1	....	....	1	....	....	....	....	9	2	2	14	26	3	14	14
Miscellaneous	1	....	....	....	....	....	....	2	93	38	46	108	77	53	156	147
Shaft	....	....	....	....	....	....	....	....	.....	.....	.....	.....	.....	.....	.....	.....
Total	3	0	0	6	4	1	4	2	142	108	109	232	128	84	217	186
Per 1,000 300-day workers	2.54	....	....	3.39	3.57	1.27	4.05	1.88	120.03	348.39	86.71	131.15	114.28	106.87	219.86	175.14

TABLE 33.—*ALL MINES: Severity of accidents, by causes, 1919–1922, showing percentage of accidents in each class.*

Cause.	Killed.	Seriously injured (time lost more than 14 days).			Slightly injured (time lost 1 to 14 days).	Total nonfatal.	Grand total (per cent).	Number killed.	Number injured.
		Permanent total disability.	Permanent partial disability.	Others.					
1. Fall of rock or ore from roof or wall	2.42	0.04	0.90	25.49	71.15	97.58	100.00	471	18,999
2. Rock or ore while loading at working face or chute	.14		.53	22.45	76.88	99.86	100.00	18	12,716
3. Timber or hand tools	.09	.01	.59	24.39	74.92	99.91	100.00	8	8,783
4. Explosives	9.04	.82	4.73	29.38	56.03	90.96	100.00	132	1,328
5. Haulage (mine cars, mine locomotives, breaking of rope, etc.)	.84		.97	31.00	67.19	99.16	100.00	94	11,123
6. Persons falling down chute, winze, raise, or stope	3.53	.04	1.02	36.20	59.21	96.47	100.00	93	2,545
7. Run of ore from chute or pocket	1.98		.42	29.10	68.50	98.02	100.00	28	1,388
8. Drilling (by machine or hand drills)	.13	.03	1.05	19.89	78.90	99.87	100.00	8	5,935
9. Electricity	6.44		1.12	20.17	72.27	93.56	100.00	23	334
10. Machinery (other than locomotives or drills)	.41		2.97	30.26	66.36	99.59	100.00	4	971
11. Mine fires	38.35			7.52	54.13	61.65	100.00	51	82
12. Suffocation from natural gases	8.10		.47	10.00	81.43	91.90	100.00	17	193
13. Inrush of water					100.00	100.00	100.00		8
14. Nails and splinters		.05	.29	17.40	82.26	100.00	100.00		2,080
15. Other causes	.24	.01	.52	23.30	75.93	99.76	100.00	36	15,174
Total underground	**1.19**	**.03**	**.83**	**25.08**	**72.87**	**98.81**	**100.00**	**983**	**81,659**
16. Falling down shaft	26.27		3.58	31.34	38.81	73.73	100.00	88	247
17. Objects falling down shaft	3.32		1.66	27.88	67.14	96.68	100.00	26	756
18. Breaking of cables	17.14		2.86	22.86	57.14	82.86	100.00	6	29
19. Overwinding	23.53			23.53	52.94	76.47	100.00	8	26
20. Cage, skip, or bucket	7.90		2.13	33.94	56.03	92.10	100.00	74	863
21. Other causes	1.61		.95	26.51	70.93	98.39	100.00	17	1,039
Total shaft	**6.89**		**1.76**	**29.47**	**61.88**	**93.11**	**100.00**	**219**	**2,960**
22. Mine cars, or mine locomotives, gravity, or aerial trams	1.43	.10	1.74	32.24	64.49	98.57	100.00	14	963
23. Railway cars and locomotives	3.69		2.34	26.30	67.67	96.31	100.00	22	575
24. Run or fall of ore in or from ore bins	1.24		.42	20.33	78.01	98.76	100.00	3	238
25. Falls of persons	1.13		.91	34.44	63.52	98.87	100.00	21	1,843
26. Nails and splinters		.09	.53	11.65	87.73	100.00	100.00		1,133
27. Hand tools, axes, bars, etc	.09		.82	17.54	81.55	99.91	100.00	2	2,302
28. Electricity	7.83		.46	15.21	76.50	92.17	100.00	17	200
29. Machinery	1.07		4.34	23.13	71.46	98.93	100.00	19	1,754
30. Other causes	.60	.01	.72	21.22	77.45	99.40	100.00	47	7,823
Total surface	**.85**	**.02**	**1.23**	**22.46**	**75.44**	**99.15**	**100.00**	**145**	**16,831**

31. **Falls or slides of rock or ore**	2.84	.10	1.21	27.76	68.09	97.16	100.00	28	959
32. Explosives	11.11	.85	7.27	30.34	50.43	88.89	100.00	26	208
33. Haulage (mine cars and locomotives and railway cars, etc.)	3.31	.13	3.44	29.13	63.99	96.69	100.00	26	760
34. Steam shovels	2.26	.15	.80	28.27	67.52	97.74	100.00	15	650
35. Falls of persons	.99		.66	23.14	75.21	99.01	100.00	6	599
36. Falls of derricks, booms, etc	3.57		5.36	23.21	67.86	96.43	100.00	2	56
37. Run or fall of ore in or from ore bins	5.56			16.66	77.78	94.44	100.00	1	17
38. Machinery (other than locomotives or steam shovels)	.29		3.81	22.58	73.32	99.71	100.00	1	340
39. Electricity	21.74			21.74	56.52	78.26	100.00	5	18
40. Hand tools			.69	16.32	82.99	100.00	100.00		870
41. Other causes	.35		.85	16.00	82.80	99.65	100.00	10	2,827
Total open pit	1.62	.07	1.59	21.50	75.22	98.38	100.00	120	7,302
Grand total	1.33	.03	.97	24.56	73.11	98.67	100.00	1,467	108,752

ACCIDENTS IN MINERAL INDUSTRIES.

Table 34 has been prepared to show the comparative accident rates for 1922 in all branches of the mineral industry for which statistics are compiled by the Bureau of Mines. Reports of nonfatal injuries at coal mines are not received by the Bureau of Mines. For all other branches of the industry, however, the highest injury rate was for the lead and zinc mines in the Mississippi Valley States, and the lowest nonfatal injury rate was for by-product coke ovens. The highest fatality rate was that for mines producing gold, silver, and miscellaneous metals, due largely to the death of 47 men in a mine fire in California; the next highest rate being that for coal mines. The lowest fatality rate was that for marble quarries.

Table 35 indicates the percentage of deaths due to each of the chief causes of accidents at coal mines, metal mines, and quarries. During the 12 years covered by the table most of the fatal accidents at coal mines were caused by falls of roof or side, use of haulage equipment. gas and coal-dust explosions, and explosives. At metal mines the main causes of fatalities have been falls of rock or ore, falls of persons, haulage equipment, and the use of explosives. Fatal accidents at quarries were mainly due to explosives, falls or slides of rock or overburden, machinery, and haulage equipment.

TABLE 34.—*Accident rates in different branches of mineral industries in 1922, compared on a 300-day basis (length of shift not considered).*

Branch of mineral industry.	Average days active.	Men employed.		Days of labor performed.	Killed.	Injured.	Number killed or injured per 1,000 300-day workers.	
		Actual number.	Equivalent in 300-day workers (calculated).				Killed.	Injured.
Coal mines	144	844,807	405,056	121,516,822	1,979	....	4.89	....
All metal mines	276	105,697	97,138	29,141,293	344	26,080	3.54	268.48
Copper mines	292	25,739	25,017	7,504,983	75	8,025	3.00	320.78
Gold and miscellaneous metal mines	284	27,614	26,144	7,843,290	140	6,805	5.35	260.29
Iron mines	257	32,241	27,621	8,286,225	83	4,901	3.00	177.44
Lead and zinc mines (Mississippi Valley)	278	8,990	8,332	2,499,531	22	3,868	2.64	464.23
Nonmetallic mineral mines	271	11,113	10,024	3,007,274	24	2,481	2.39	247.51
All quarries (including outside works)	261	79,081	68,861	20,658,338	132	11,839	1.92	171.93
Cement-rock quarries	312	12,260	12,759	3,827,691	29	2,438	2.27	191.08
Granite quarries	236	8,956	7,038	2,111,525	10	1,036	1.42	147.20
Limestone quarries	253	39,961	33,728	10,118,317	63	5,994	1.87	177.72
Marble quarries	289	4,803	4,626	1,387,908	2	591	.43	127.76
Sandstone and bluestone quarries	233	4,305	3,349	1,004,588	4	337	1.19	100.63
Slate quarries	266	3,941	3,493	1,048,031	11	445	3.15	127.40
Traprock quarries	239	4,855	3,868	1,160,278	13	998	3.36	258.01
All quarries (excluding outside works)	246	48,527	39,788	11,936,454	92	7,049	2.31	177.16
All quarries (outside works only)	285	30,554	29,073	8,721,884	40	4,790	1.38	164.76
Metallurgical plants:								
Ore-dressing plants	284	11,676	11,052	3,315,471	12	1,984	1.09	179.51
Smelters	321	19,495	20,887	6,266,159	16	3,002	.77	143.71
Auxiliary works	329	12,829	14,069	4,220,688	17	1,692	1.21	120.26
All coke ovens	284	19,278	18,236	5,470,939	29	1,710	1.59	93.77
Beehive coke ovens	184	7,871	4,823	1,447,119	8	474	1.66	98.28
By-product coke ovens	353	11,407	13,413	4,023,820	21	1,236	1.57	92.15
Total, 1922	**174**	**1,092,863**	**635,299**	**190,589,710**	**2,529**	**46,307**	**3.98**	**201.12**
Total, 1921	189	1,048,036	658,537	197,560,952	2,367	35,416	3.59	192.19

TABLE 35.—*METAL MINES, COAL MINES, AND QUARRIES: Principal causes of fatalities, showing percentage due to each cause, 1911 to 1922, by years.*

Industry.	Cause of death.								Total.
	Falls of overburden, roof, quarry material, ore, or coal.	Explosives.	Haulage and handling rock, ore, or coal.	Falls of persons.	Electricity.	Machinery.	Gas and dust explosions.	Other causes.	
1911:									
Metal mines	**32.52**	**11.22**	**7.63**	**15.39**	**2.45**	**3.16**	....	**27.63**	**100.00**
Coal mines	47.40	6.02	17.13	1.28	3.73	1.51	13.74	9.19	100.00
Quarries	25.53	26.60	20.21	8.51	1.07	9.04	....	9.04	100.00
1912:									
Metal mines	**34.49**	**14.22**	**10.28**	**13.92**	**3.78**	**3.78**	....	**19.52**	**100.00**
Coal mines	49.03	6.08	19.14	1.36	3.64	1.65	11.99	7.11	100.00
Quarries	17.37	22.06	27.70	8.92	1.87	11.74	....	10.33	100.00
1913:									
Metal mines	**34.70**	**13.03**	**12.88**	**12.30**	**3.81**	**4.39**	....	**18.89**	**100.00**
Coal mines	45.39	4.96	18.31	1.80	3.16	1.80	18.45	6.13	100.00
Quarries	14.75	24.04	23.50	9.29	2.73	12.57	....	13.12	100.00
1914:									
Metal mines	**36.32**	**10.73**	**10.20**	**16.10**	**3.04**	**2.50**	....	**21.11**	**100.00**
Coal mines	46.09	5.95	18.79	2.85	4.07	1.87	14.22	6.16	100.00
Quarries	29.45	19.44	18.33	12.78	1.67	6.11	....	12.22	100.00
1915:									
Metal mines	**36.71**	**14.10**	**10.49**	**15.91**	**2.53**	**1.99**	....	**18.26**	**100.00**
Coal mines	47.55	6.83	18.64	1.37	4.36	1.68	13.40	6.17	100.00
Quarries	30.40	18.92	15.55	11.48	2.03	9.46	....	12.16	100.00
1916:									
Metal mines	**32.28**	**12.77**	**10.04**	**14.64**	**3.73**	**2.58**	....	**23.96**	**100.00**
Coal mines	47.84	6.56	20.89	1.39	4.36	1.89	10.15	6.92	100.00
Quarries	19.08	16.18	19.66	8.09	4.05	16.76	....	16.18	100.00
1917:									
Metal mines	**26.17**	**9.27**	**10.33**	**13.15**	**2.23**	**2.00**	....	**36.85**	**100.00**
Coal mines	45.18	4.08	22.11	.96	3.52	2.34	13.43	8.38	100.00
Quarries	18.32	16.03	24.43	11.45	1.52	15.27	....	12.98	100.00
1918:									
Metal mines	**29.72**	**13.78**	**13.00**	**12.85**	**3.87**	**3.25**	....	**23.53**	**100.00**
Coal mines	50.13	5.23	24.20	.81	3.99	2.21	5.01	8.42	100.00
Quarries	14.40	13.60	24.80	12.00	3.20	14.40	....	17.60	100.00
1919:									
Metal mines	**38.46**	**10.26**	**10.90**	**16.02**	**3.42**	**4.27**	....	**16.67**	**100.00**
Coal mines	47.48	8.89	20.37	.86	3.41	2.07	8.24	8.68	100.00
Quarries	12.19	19.51	25.20	6.51	4.07	16.25	....	16.27	100.00
1920:									
Metal mines	**33.41**	**13.41**	**14.11**	**10.59**	**4.24**	**4.24**	....	**20.00**	**100.00**
Coal mines	49.87	5.64	21.37	1.19	4.11	2.70	7.26	7.86	100.00
Quarries	18.54	20.23	25.84	7.30	3.93	11.80	....	12.36	100.00
1921:									
Metal mines	**31.30**	**10.00**	**10.00**	**17.39**	**1.74**	**2.61**	....	**26.96**	**100.00**
Coal mines	51.64	7.71	19.36	.91	4.92	1.72	5.83	7.91	100.00
Quarries	16.67	14.17	17.50	9.17	7.50	15.83	....	19.16	100.00
1922:									
Metal mines	**30.52**	**8.72**	**11.63**	**13.95**	**2.04**	**3.20**	....	**29.94**	**100.00**
Coal mines	45.66	4.62	19.99	.71	4.21	2.03	15.78	7.00	100.00
Quarries	18.94	27.27	12.88	5.30	4.55	18.94	....	12.12	100.00

TABLE 36.—*ALL MINES: Widows and orphans caused by fatal accidents, by States, during the years ended December 31, 1922 and 1921.*

State.	1922		1921	
	Widows.	Orphans.	Widows.	Orphans.
Alabama	10	11	2	7
Alaska			2	
Arizona	8	17	10	9
California	15	25	5	10
Colorado	3	5	6	10
Florida	3	3	3	4
Georgia				
Idaho	2	4	2	6
Illinois	2	7	1	1
Iowa				
Kansas				
Kentucky				
Michigan	23	50	33	66
Minnesota	22	47	14	31
Missouri	10	14	5	27
Montana	3	5	5	6
Nevada	2	4	1	2
New Jersey			1	6
New Mexico	5	7	1	
New York	7	31	7	27
North Carolina				
Oklahoma	4	4	3	4
Oregon			1	1
Pennsylvania				
South Dakota	2	5	1	2
Tennessee			1	
Texas	2	4		
Utah	8	16		
Virginia	1	3	2	1
Washington				
Wisconsin				
Wyoming				
Other States	14	25	6	12
Total, 1922	**146**	**287**		
Total, 1921			**112**	**232**

TABLE 37.—***ALL MINES:*** *Number of active operators, by States, 1916 to 1922.*

State.	1916	1917	1918	1919	1920	1921	1922
Alabama	22	42	38	31	23	15	15
Alaska	428	362	270	438	385	434	603
Arizona	445	450	321	304	299	280	211
California	840	628	389	293	283	201	244
Colorado	738	407	450	461	452	344	244
Florida	14	15	14	18	21	18	13
Georgia	26	29	20	18	16	11	8
Idaho	510	414	282	278	331	314	255
Illinois	7	11	8	10	7	6	5
Iowa	9	8	6	5	6	7	7
Kansas	29	28	26	19	21	15	20
Kentucky	8	25	15	13	14	9	9
Michigan	76	86	70	60	59	49	43
Minnesota	63	66	62	57	53	41	38
Missouri	159	210	101	45	35	17	15
Montana	328	284	216	195	196	189	139
Nevada	406	405	414	406	297	277	207
New Jersey	7	6	6	6	6	5	3
New Mexico	123	135	92	89	90	79	57
New York	37	33	31	29	26	22	21
North Carolina	23	23	25	16	18	11	11
Oklahoma	37	42	51	49	49	29	34
Oregon	210	183	140	104	118	118	70
Pennsylvania	21	19	18	14	10	8	9
South Dakota	65	64	48	38	35	30	24
Tennessee	25	32	37	24	24	16	19
Texas	11	12	14	11	11	9	13
Utah	223	233	178	125	177	160	113
Virginia	27	36	40	30	24	15	14
Washington	176	168	112	106	110	99	84
Wisconsin	51	53	50	25	22	16	11
Wyoming	49	42	31	19	19	19	16
Other States	65	86	61	47	44	33	24
Total	**5,258**	**4,637**	**3,636**	**3,383**	**3,281**	**2,896**	**2,599**

[1] Not segregated.

TABLE 38.—*ALL MINES: Men employed and the equivalent in 300-day workers, 1921 and 1922, with 5-year summary figures.*

State.	Actual number.			Number 300-day workers.		
	Total, 5 years 1917-1921.	1921	1922	Total, 5 years 1917-1921.	1921	1922
Alabama	37,016	4,830	6,219	34,475	2,806	5,413
Alaska	21,570	2,736	3,346	17,130	2,064	2,609
Arizona	78,208	6,988	8,848	79,617	5,585	8,903
Arkansas	3,905	221	252	3,296	151	202
California	35,563	4,737	5,224	35,987	4,499	5,078
Colorado	31,048	3,808	3,181	28,183	3,271	2,943
Florida	16,417	3,283	1,759	13,951	2,353	1,490
Georgia	2,744	258	161	2,128	145	118
Idaho	21,410	3,375	3,823	19,268	2,810	3,271
Illinois	3,259	581	569	2,638	189	495
Iowa	1,881	295	274	1,525	208	232
Kansas	5,185	868	1,380	4,141	587	1,206
Kentucky	2,259	330	685	1,715	253	537
Michigan	134,610	15,951	17,303	128,256	11,843	15,666
Minnesota	85,857	11,414	11,987	80,246	9,176	10,235
Missouri	31,165	4,079	4,417	27,257	3,933	4,422
Montana	60,719	5,262	9,751	61,001	5,137	9,871
Nevada	23,739	3,385	3,230	25,404	3,027	3,031
New Jersey	9,143	1,162	756	8,209	687	622
New Mexico	17,855	2,349	1,313	16,402	1,192	1,105
New York	16,783	2,521	2,690	15,847	1,874	2,272
North Carolina	2,704	323	352	2,101	184	239
Oklahoma	17,260	1,813	3,004	14,272	1,115	2,665
Oregon	4,055	487	297	2,689	207	204
Pennsylvania	1,835	304	427	1,536	160	406
South Dakota	7,862	1,648	1,701	8,701	1,850	1,844
Tennessee	15,378	2,221	2,064	13,353	1,510	1,643
Texas	6,225	760	1,691	6,845	688	1,467
Utah	28,399	4,001	4,731	30,499	3,980	5,156
Virginia	9,416	1,034	1,191	8,191	874	1,067
Washington	4,244	428	361	3,134	212	221
Wisconsin	12,412	907	1,068	10,786	519	832
Wyoming	1,833	295	260	1,387	151	233
Other States	7,000	1,275	1,382	6,841	1,269	1,470
Total	**758,959**	**93,929**	**105,697**	**717,011**	**74,509**	**97,188**

TABLE 39.—*ALL MINES: Days of labor performed and average number of days mines were operated, by States, 1921 and 1922, with 5-year summary figures.*

State.	Days of labor performed.			Average days active.		
	Total 5-years 1917-1921.	1921	1922	Total 5-years 1917-1921.	1921	1922
Alabama	10,342,545	841,731	1,623,744	279	174	261
Alaska	5,138,738	619,080	782,717	238	226	234
Arizona	23,884,731	1,675,378	2,670,980	305	240	302
Arkansas	988,833	45,368	60,480	253	205	240
California	10,796,343	1,349,592	1,523,410	304	285	292
Colorado	8,454,470	981,175	882,700	272	258	277
Florida	4,185,259	706,017	437,946	255	215	249
Georgia	638,187	43,398	35,284	231	168	219
Idaho	5,780,175	842,927	981,135	270	250	257
Illinois	791,141	56,727	148,366	243	98	261
Iowa	457,390	62,288	69,681	243	211	254
Kansas	1,242,931	176,982	361,946	240	204	262
Kentucky	514,356	75,751	161,154	228	230	235
Michigan	38,476,817	3,553,013	4,699,705	286	223	272
Minnesota	24,073,748	2,752,669	3,070,572	280	241	256
Missouri	8,177,316	1,179,855	1,326,645	262	289	300
Montana	18,300,670	1,541,120	2,961,273	301	293	304
Nevada	7,621,134	908,170	909,400	321	268	282
New Jersey	2,462,824	206,079	186,725	269	177	247
New Mexico	4,920,541	357,527	331,548	276	152	253
New York	4,753,775	562,345	681,645	283	223	253
North Carolina	630,336	55,264	71,859	233	171	204
Oklahoma	4,281,624	334,477	799,646	248	184	266
Oregon	806,467	62,010	61,047	199	127	206
Pennsylvania	461,087	48,015	121,881	251	158	285
South Dakota	2,610,799	555,093	553,178	332	337	325
Tennessee	4,005,851	453,089	492,862	260	204	239
Texas	2,053,855	206,369	440,150	330	272	260
Utah	9,149,948	1,194,046	1,546,671	322	298	327
Virginia	2,456,807	262,115	320,242	261	253	269
Washington	940,270	63,553	66,266	222	148	184
Wisconsin	3,235,610	155,575	249,492	261	172	234
Wyoming	416,304	45,465	69,930	227	154	269
Other States	2,052,622	380,439	441,013	293	298	319
Total	**215,103,504**	**22,352,702**	**29,141,293**	**283**	**238**	**276**

TABLE 40.—*ALL MINES: Fatalities and injuries, by States and years, 1921 and 1922, with 5-year summary figures.*

State.	Number killed.			Number injured.		
	Total 5-years 1917-1921.	1921	1922	Total 5-years 1917-1921.	1921	1922
Alabama	118	5	17	7,365	642	976
Alaska	68	13	4	1,557	218	192
Arizona	302	23	23	32,987	1,826	3,235
Arkansas	3			234	16	38
California	159	17	64	10,152	1,315	1,397
Colorado	157	15	13	3,902	733	427
Florida	37	5	4	1,999	517	419
Georgia	5			110	4	
Idaho	74	9	9	4,482	836	959
Illinois	14	1	3	414	16	49
Iowa	1	1		267	51	91
Kansas	17	1	1	1,302	298	641
Kentucky	3		1	209	56	78
Michigan	391	43	34	29,053	2,978	3,536
Minnesota	237	23	31	16,225	1,660	1,379
Missouri	80	8	11	6,213	876	988
Montana	377	13	32	14,261	864	2,497
Nevada	105	8	10	3,926	570	745
New Jersey	31	3	5	1,290	83	194
New Mexico	50	2	9	3,316	185	243
New York	65	12	17	5,157	1,067	1,009
North Carolina	5			241	1	14
Oklahoma	62	3	6	5,859	699	2,009
Oregon	8	2		460	26	36
Pennsylvania	1		1	135	10	21
South Dakota	19	1	5	2,725	653	602
Tennessee	39	4	3	3,093	445	378
Texas	13		3	1,447	273	399
Utah	106	10	27	8,334	1,149	2,564
Virginia	20	2	1	756	114	96
Washington	8		3	525	10	20
Wisconsin	34	1	3	2,722	125	125
Wyoming	3	1	1	81	18	24
Other States	9	4	3	1,074	270	699
Total	**2,621**	**230**	**344**	**171,873**	**18,604**	**26,080**

TABLE 41.—*ALL MINES: Fatalities and injuries per 1,000 300-day workers employed, by States, 1921 and 1922, with 5-year summary figures.*

State.	Number killed per 1,000 300-day workers.			Number injured per 1,000 300-day workers.		
	Total, 5 years 1917-1921.	1921	1922	Total, 5 years 1917-1921.	1921	1922
Alabama	3.42	1.78	3.14	213.63	228.80	180.31
Alaska	3.97	6.30	1.53	90.89	105.62	73.59
Arizona	3.79	4.12	2.58	414.32	326.95	363.36
Arkansas	.91	....	....	71.00	105.96	188.12
California	4.42	3.78	12.60	282.10	292.29	275.11
Colorado	5.57	4.59	4.42	138.45	224.09	145.09
Florida	2.65	2.12	2.74	143.29	219.72	286.99
Georgia	2.35	....	....	51.69	27.59	....
Idaho	3.84	3.20	2.75	232.61	297.51	293.27
Illinois	5.31	5.29	6.06	156.94	84.66	98.99
Iowa	.66	4.81	....	175.08	245.19	392.24
Kansas	4.11	1.70	.83	314.42	507.67	531.51
Kentucky	1.75	....	1.86	121.87	221.34	145.25
Michigan	3.05	3.63	2.17	226.52	251.46	225.71
Minnesota	2.95	2.51	3.03	202.19	180.91	134.73
Missouri	2.94	2.03	2.49	227.94	222.73	223.43
Montana	6.18	2.53	3.24	233.78	168.19	252.56
Nevada	4.13	2.64	3.30	154.54	188.31	245.79
New Jersey	3.78	4.37	8.04	157.14	120.82	311.90
New Mexico	3.05	1.68	8.14	202.17	155.20	219.91
New York	4.10	6.40	7.48	325.42	569.37	444.10
North Carolina	2.38	....	....	114.71	5.43	58.58
Oklahoma	4.34	2.69	2.25	410.52	626.91	753.85
Oregon	2.98	9.66	....	171.07	125.60	177.34
Pennsylvania	.65	....	2.46	87.89	62.50	51.72
South Dakota	2.18	.54	2.71	313.18	352.97	326.46
Tennessee	2.92	2.65	1.83	231.63	294.68	230.07
Texas	1.90	....	2.04	211.40	396.80	271.98
Utah	3.48	2.51	5.24	273.25	288.69	498.06
Virginia	2.44	2.29	.94	92.30	130.43	89.97
Washington	2.55	....	13.57	167.52	47.17	90.50
Wisconsin	3.15	1.93	3.61	252.36	240.85	150.24
Wyoming	2.16	6.62	3.85	58.40	119.21	92.31
Other States	1.32	3.15	2.04	156.99	212.76	475.51
Total	**3.66**	**3.09**	**3.54**	**239.71**	**249.69**	**268.48**

PUBLICATIONS ON MINE AND QUARRY ACCIDENT STATISTICS.

A limited supply of the following publications of the Bureau of Mines has been printed. Requests for copies should be addressed to the Director, Bureau of Mines.

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AVAILABLE FOR FREE DISTRIBUTION.

BULLETIN 115. Coal-mine fatalities in the United States, 1870–1914, with statistics of coal production, labor, and mining methods, by States and calendar years, compiled by A. H. Fay. 1916. 570 pp., 3 pls., 13 figs.

TECHNICAL PAPER 194. Report of the committee on the standardization of mining statistics, compiled by A. H. Fay. 1918. 57 pp.

TECHNICAL PAPER 302. Coal-mine fatalities in the United States, 1921, by W. W. Adams. 1922. 72 pp.

TECHNICAL PAPER 321. Metal-mine accidents in the United States during the calendar year 1921, by W. W. Adams. 1923. 96 pp.

TECHNICAL PAPER 329. Quarry accidents in the United States during the fiscal year 1921, by W. W. Adams. 1923. 90 pp.

TECHNICAL PAPER 339. Coal-mine fatalities in the United States, 1922, by W. W. Adams. 1923. — pp.

TECHNICAL PAPER 353. Quarry accidents in the United States during the calendar year 1922, by W. W. Adams. 1923. — pp.

OBTAINABLE ONLY THROUGH THE SUPERINTENDENT OF DOCUMENTS.

BULLETIN 96. Coal-mine accidents in the United States and foreign countries, compiled by F. W. Horton. 1913. 102 pp., 3 pls., 40 figs. 25 cents.

TECHNICAL PAPER 275. Quarry accidents in the United States during the calendar year 1919, compiled by W. W. Adams. 1920. 66 pp. 10 cents.

TECHNICAL PAPER 291. The production of explosives in the United States during the calendar year 1920, by W. W. Adams. 1921. 44 pp., 4 figs. 5 cents.

TECHNICAL PAPER 299. Metal-mine accidents in the United States during the fiscal year 1920, by W. W. Adams. 1922. 99 pp. 10 cents.

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